73 Amateur Radio today

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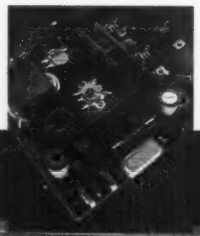

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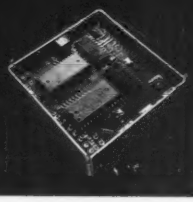

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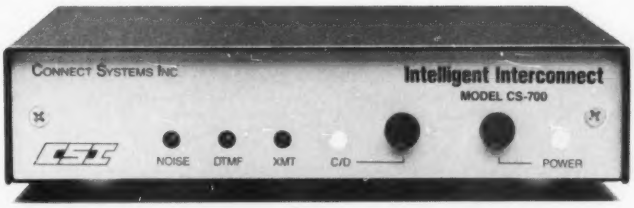

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LETTERS

From the Hamshack

Bill Fisher N4IV, Reidsville NC: Wayne, thanks for taking the time to chat with me over the telephone last week. I enjoyed meeting you.

With any luck, we should have about 20 new Novices at the Reidsville Middle School this fall. Today the senior high principal told me that her head custodian and one of her assistant principals have requested release time so they can attend my class at the middle school!

We will have a reasonably well-equipped station. Donations so far include a Viking I and SX-71, a 32-V2 and NC-183, and an SB-101. We also have a 3-element yagi for 10m and a C-64 with a PC compatible likely. Now I've got to pick up a TNC and learn something about packet (I picked up the book from you).

On 10 July I ran demonstrations for the summer school students at Reidsville Senior High. We had seven very good phone QSOs and one CW QSO. Of the guys who gave their ages, the median was 76. Several students wanted to know if any young people were hams!

On 7 and 8 July I ran demos at the Elks Club Boys Camp in Zirconia, North Carolina. Fifteen meters was in fine shape, and the campers got to talk to several young-sounding hams in Japan, Canada, East and West Germany, the Soviet Union, France, and Bulgaria. The camp director wants to put in a ham radio program next summer. If you know a college kid who might like to work as a camp counselor in ham radio, could you ask him to get hold of me?

Wayne, I greatly appreciate all that you do for ham radio. Maybe we can blast the League off ground zero and get the hobby moving again. Thanks for your time and attention.

Bob Beattie KB6UBP/7, Klamath Falls OR: Just resubscribed to *73* after a couple of years . . . have missed your editorials. Doesn't matter if I agree or disagree with your opinions, at least you have some! Hi, hi.

Called your editorial offices yesterday for some badly needed information, and your staff was exceedingly helpful and thoughtful. Do want you to know your staff is every bit as pleasant and knowledgeable as the staff at Ten-Tec. This is a real accomplishment in this day and age.

I made a presentation to an elementary school principal here in Klamath Falls about the possibilities of an electronics/amateur radio class or club starting this September. He was favorably inclined to go with the idea, and we spent about an hour or so going over what ham radio is all about. My feeling is that if we can get 5th and 6th graders interested in amateur radio/electronics, continue the program through junior high and high school, then we have new skills, new jobs, and new paychecks in an area where clear-cut logging has destroyed the forest-related industrial base. The spotted owl thing is just a smokescreen for the fact that automation has come to the woods, and there will not be very many jobs available in the near future.

This is my second letter to you. The first was a couple of years ago. In that letter, I told you to read it if you had the time, or just throw it in the garbage if you didn't. Your staff assured me that you do read letters (poor man). My thanks to you for the magazine and to your staff for their help.

Yep, I read 'em all—quite a bunch, too, between about a dozen publications.

Do be sure to keep me informed on how you're making out with the school. If you get some Novices going, I want pictures.

According to the National Association of Record Merchandisers (NARM) who is fighting me on the longboxes for CDs, America's forests are being replanted at such a rate that there has been a net gain in forests. That wasn't what I saw when I flew over Oregon a couple years ago. I saw whole mountains of trees slashed and no visible reseeding.

Glad the staff was able to help . . . they're great.—Wayne

Stephen Crow WA2CPX, Ft. Lauderdale FL: Self-righteousness on public display doesn't have much appeal to us, especially when its broken-record brawl is turned up all the way. And in our time, "maximum" seems to be the only dial setting on 14.313.

How many years has it been now that we keep hearing the same shoddy holier-than-thou demonstrator on 20 meters? There he is, mouth wide open and screaming, words distorted in an ugly scowl, trashing somebody or something—now phone patching—then "rich yachties"—and generally carrying on in an aggressively obnoxious manner.

But it's for (fill in THE CAUSE here), so it's OK. Ladies and gentlemen of the audience, this noble idealist is acting like a thug and bully because he's awarded himself a moral blank check. Such behavior would get a 10-year-old spanked and his radio plug pulled. It is thought to be sanctified if done by an over-powered, over-driven, pseudo-politician claiming to be a champion of free speech. He and his ilk, one in Ft. Lauderdale, and two others in Florida and Arkansas, should have their composite power supplies short-circuited once and for all.

Unfortunately the trust of our system is such that means and methods from such evil sources can corrupt the most virtuous goals.

Certainly most listeners know that as they hear one of these temper tantrums parading by on their 20 meter dial, they're not hearing the idealist, but only an immature brat.

Wayne, now it has been many months continuing—are you still going to ignore this controversy?

Ignore the controversy? Me? If you'd go to the trouble to visit someone who gets 73, you'd see that I have not ignored this at all. I've mentioned FZ and his emotional problems several times . . . like last month, for instance.

I also proposed a simple, practical solution to the whole mess. You'll read even more about it in my next editorial.—Wayne

John T. Phillipp, M.D., N6ZAE, Glendora CA: In "The Hidden Receiver Hunt," by Robin B. Rumbolt WA4TEM in the July issue, he mentions the difference between true north and magnetic north. He says, "There is a difference. A call to your local airport should put you in touch with someone who knows what the difference (magnetic declination) is in your area. Pilots have to know that stuff. Here in Tennessee, the difference is one degree. Big deal, but I had to mention it."

Well, we pilots do indeed have to know that stuff. First, the difference is called the magnetic VARIATION, not declination. Second, here in Los Angeles, the magnetic variation is 14 degrees east; the magnetic heading is 14 degrees less than the true heading. Want to go due west (270 degrees)? You'll have to fly a heading of 256 degrees on your magnetic compass. If you fly 50 miles on a true heading, when you mean to fly on a magnetic heading, you end up 12 miles off course!

Just had to get that corrected, Wayne. I just got back into ham radio after almost 20 years away from it. I let my Advanced Class (WB2HYI) lapse many years ago (something about medical school and residency taking up most of my time). I came across an issue of *73* magazine a couple of months ago (I was surprised to see that it was still being published after all these years! And that you haven't changed a bit!) and the bug bit again. Boy, have there been a lot of changes! Volunteer examiners, books of questions, new bands . . . lots of new bands, satellites, packet, repeaters, microprocessor-controlled rigs, new privileges for the Novice Class. One thing hasn't changed, though. Morse code. Well, I got up to 20 wpm, and last week I passed the Extra Class exam. Hope to see you on the air.

Walter A.L. King N3EID, Hellertown PA: When I wrote my letter to Wayne, I did not expect to see it published in *73*. However, I am delighted that it did appear.

I would like to make two comments about the letter. When it was edited for publication, an important omission was made: I think I wrote that the crystal kit did *not* have the old-style crystal, but rather a diode with a germanium crystal fused in it. Please see the third paragraph in the published letter *[in the August 1990 issue, page 2.]*.

Secondly, about your comment . . . granddaughters. We were blessed with seven grandsons over the years, and only last fall did we enjoy the thrill of a baby granddaughter. When her time comes, and if I am still around, you can bet she will be in the radio shack and get the full treatment. I want folks to know that I am an equal opportunity granddaddy!

Keep up the fine work, and hello to Wayne.

Thank you for the correction; that line should have read, "They don't have the old-fashioned cat's whisker, but they do have a diode with a germanium crystal fused into it." Either a few words were accidentally left out or mistakenly erased, and I didn't catch the error in proofing. My mistake—and my apologies.

Your granddaughter is a very lucky girl.—Linda KA1UKM

Dick Goodman WA3USG, Mechanicsburg PA: I recently received the August issue of *73* and wanted to write to give you and your staff an "Attaboy." I have shown this issue to several young non-hams 15–18 years-old, and they have all responded enthusiastically. Most did not realize that hams did things like flying remote ATV helicopters, and launching ATV balloons and rockets with TV transmitters in them. Things like this get a lot more attention from the young than simply talking with other hams over a radio (even though they may be on the other side of the earth).

I cannot fault the young today, their frontiers are different and possibly more dynamic than ours were. Where we found it amazing to receive a weak, scratchy voice from a few thousand miles away, they take it for granted. The kids today are growing up in a high tech world, and much of what goes on in hamdom is not high tech.

There is nothing wrong with getting on HF and working contests, or rag-chewing on 40 or 75 meters, but the young are not interested in that.

*Glad to see you're sharing the magazine with some young people. It's about time we stopped **telling** kids how difficult ham radio is, and started **showing** them how much fun it is. We should all make it a priority to become someone's Elmer.—David N1GPH.*

Robert KC4RKJ and Lorraine Matthew N4ZCF, Santa Rosa Beach FL: *[Addressing the FCC:]* The formation of the Communicator license and the elimination of either the Novice or Tech to accommodate the new class will not do a thing for the hobby. It will bring in a few new people, but it will not build the number of ranks that you hope. A while back my son was watching my wife, who has gone from Novice to Advanced in six months, work DX. He was fascinated. We offered to help him get started and filled him in on what he would have to do. He commented that he would have to waste a lot of time before he could use the license to do what he would like to do. Also, it isn't a low-cost hobby.

As a high school teacher, I have encouraged young people to get involved in both radio and flying, but I've had little success. Both of these hobbies are desirable, but far out of reach of young people. It's too costly in time and money.

It seems to me that we should have a look at using the output power, not the code, as the control for various licensing levels. In Japan they have low-output radios that would allow more flexibility. It would encourage building equipment and antennas, even possibly the conversion of cheap CB units to the 10m band. We are one of the few countries that divides the bands up based on license class. This discourages many worthy people from entering the amateur community. DXers and clubs from foreign countries schedule events on frequencies inaccessible to most American amateurs. Let the amateur bands be more open to all license classes but on a power limit basis.

The code should be relaxed, but not eliminated in the acquisition of the more advanced classes. All types of transmissions should be encouraged.

I can visualize the last ham sitting in front of $20,000 worth of equipment and no one to contact. 73

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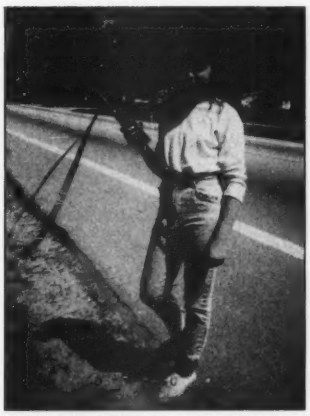

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Cover by Alice Scofield

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David Cassidy N1GPH

MANAGING EDITOR
Bill Brown WB8ELK
PRODUCTION EDITOR
Hope Currier
SENIOR EDITOR
Linda Reneau KA1UKM
ASSOCIATE EDITOR
Joyce Sawtelle
CONSULTING EDITOR
Mike Nugent WB8GLQ
CONTRIBUTING EDITORS
Mike Bryce WB8VGE
David Cowhig WA1LBP
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ADVERTISING SALES REPRESENTATIVES
Pamela Dass
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1-800-225-5083

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William Heydolph
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ART DIRECTOR
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TYPESETTING/PAGINATION
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GRAPHIC SERVICES
Dale Williams
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WGE PUBLISHING INC.
CHIEF FINANCIAL OFFICER
Tim Pelkey
CIRCULATION COORDINATOR
Harvey Chandler
CIRCULATION ASSISTANT
Janet LaFountaine
To subscribe: 1-800-289-0388

Editorial Offices
WGE Center
Forest Road, Hancock NH 03449
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NEVER SAY DIE

Wayne Green W2NSD/1

Whew!

Thirty years! You know, it seems like a hundred and thirty, considering all the guff I've had to put up with. Yep, thirty years ago, up to my eyebrows in hock, I published my first issue of *73*. Oh, I tried to talk some wealthy hams into putting up money to back it, but they said it was a lousy investment. They were right. You know, I don't recall any year when *73* ever made any money. But then it didn't lose much either . . . not enough to be put out of its misery. When there was even a remote chance it might make money I'd print more pages and we'd be back in the red again.

I've often chuckled at my multitudes of detractors (who have always greatly outnumbered my tractors) and their unshakable belief that Wayne is out to make zillions out of amateur radio. Other than a few hams I shot down because they were out to screw other hams, I don't recall ever meeting an intelligent Wayne-hater. I've always written my editorials for thinking hams and figured the others should just make do as best they could.

I kinda fell into this publishing thing, back in 1951 . . . and I liked it. I repeat that old story every ten years or so. Since most of you are getting on in years and don't remember well, I'll remind you.

It had to do with me getting all het up over radio Teletype. You know, digital communications. This zapped me in 1949. By 1951 I was frustrated because no one was publishing a RTTY newsletter. That's when I went to work as a TV director at WXEL in Cleveland . . . where they had a semi-idle mimeograph machine! I was in business and soon had over 2,000 enthusiastic subscribers!

That led to a RTTY column in *CQ* and me becoming the editor in 1955. When they fired me in 1960, I said what the heck and started *73*. Yes, I could write a whole book about all that . . . and I probably will some day. I've had many interesting adventures . . . known lots of good guys and some rotten scoundrels. Most were interesting and really should get their rewards.

So, if it isn't money, why have I bothered to publish *73* all these years . . . and a few dozen other publications? I started my first RTTY magazine because I was getting such a kick out of the hobby I wanted to convince others to give it a try and enjoy it with me. Heck, I started *73* in order to help share my love of building stuff. I'm still trying to shovel coal up that steep chute.

When SSB came along I was one of the first to try it. It was a ball! So I pushed SSB. When repeaters came along I put one up and wow! So I published hundreds of articles, lots of books, published a dedicated repeater magazine and held repeater symposiums all around the country. I watched a handful of converted obsolete taxi radios turn into the biggest single ham activity in the world . . . and then into a huge industry called cellular radio.

When the first microcomputer came on the market in 1975 (the MITS Altair) it was advertised first in *73*. I tried one . . . wow, again! That gave me the idea for *Byte* and I went on to build a microcomputing publishing micro empire.

> ***"Will 73 be around in another 30 years? Only if amateur radio is around, and I'd give that maybe a 1% reality check, the way things are going."***

These days I'm sharing my lifetime love of music with over 300,000 *CD Review* readers and they have Love Wayne and Hate Wayne clubs too. You should see what I have to say about rock'n'roll.

Though money was never a goal, I ended up making piles of it . . . kinda by accident. If you've read anything about entrepreneurs at all you know that few (if any) are money driven. I've often had people working for me who drew larger salaries . . . and when the till was running on empty, I'd put my savings back in again.

My goals today are modest . . . to try and breathe some life into the few smoldering embers of our once great hobby . . . to help break organized crime's control of the music industry . . . to help break organized crime's hold on the magazine distribution business . . . to help improve America's educational system and build it to where it can provide an inexpensive top-notch education for the entire world. That doesn't seem like much, so perhaps I should consider adding in world peace. Nah, too dangerous. I don't mind having The Mob irritated with me, but I sure don't want to ruffle America's military-industrial complex.

Some hams are resentful that my years of hard work got me some money. It's nice to finally have some, but I've tried to explain, if money is your goal, it's pathetically easy to make gobs of it. I've written about this for years in all of my magazines, urging everyone to try entrepreneurialism. It's fun and it can pay off better than any other route to success there is.

I really should write a book on how to be successful. Heck, people tell me I should write my autobiography . . . or one on how the microcomputer industry got started . . . and one on how the mind works and how to repair it. Sure, sure . . . right after I help get amateur radio going again and get the music industry fixed.

Will *73* be around in another 30 years? Only if amateur radio is around, and I'd give that maybe a 1% reality check, the way things are going. Of course, if you surprise me and stop re-electing the same tired old politicians as ARRL directors . . . but I'm dreaming, aren't I? Most of you are my age, so you know how it is to dream impossible dreams. Let's see, where did I put my lance? I've got to give that damned old windmill one more whack.

"Trashing" the League

If I were to suggest that we really might be able to do better than Bush as president or Bentsen as a Senator, would your reaction be that Wayne is trying to "trash" our government?

When I suggested that it was time to elect a new set of directors, I expected the same old knee-jerk response . . . Wayne is "trashing" the League. I got it, but I was disappointed. Perhaps the old timers who used to react that way to even the slightest hints that the League could be even marginally improved must have been smokers . . . and died. Chalk one up for the American cigarette industry.

It's too late to make any major changes this year, so let's get started toward cleaning up the mess we've allowed to turn into rotten, stinking garbage. Let's make 1991 the year we get some new and enthusiastic ARRL directors. Remember, half of those old . . . er . . . men come up for election every year, so by the end of 1992 we can have 15 new, bright faces (and maybe minds) in place and be on our way toward rescuing amateur radio . . . and perhaps our country.

Bush promised "No New Taxes" and got elected. Perhaps the rallying cry for hopeful new directors will be a guarantee to "Throw Out Price"!

For those of you with ultra-short memories, it wasn't long ago that the League promised to get us 50,000 new hams. Then Price and the directors did absolutely nothing to make it really happen.

Step One

One reason you keep re-electing the same old hacks every other year is a lack of information. All you get in *QST* is a totally sanitized version of what's happening, so you have no idea at all of what is really going on. Let's get started toward the first informed ARRL election in history. Let's make 1991 the year a new crew started moving into the League and cleaning house . . . starting with good old boy Price.

I understand from impeachable sources that there are just two directors who have the intelligence, business experience and true interest in amateur radio that we, the shareholders (ARRL members), might consider keeping in place as directors. What we all need is information, both about the incumbents and anyone new running for director. If you know of any reasons someone should (or shouldn't) be elected as director, put it in writing and send it to me.

Yes, I know, you're terrified that the League's legendarily brutal storm troopers will burn down your house and murder your children in their beds, so you personally don't want to take a chance on being identified as the fink who ratted on a director. Fear not, oh timid one, your secret testimony will die with me.

It's time you started looking around for some hams who are so deeply involved with helping amateur radio that they can be suckered into running for director. The requirements are simple . . . four years continuous membership and no connections with the ham industry. Yes, I know, this tends to rule out almost 100% of your club members, so it isn't going to be easy to find good candidates.

Continued on page 82

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TH-75A

2m/70cm Dual Band HT

The new TH-75A Dual Band HT from Kenwood is here now! Many of the award-winning features in our dual band mobile transceivers are designed into one hand-held package.

- **Dual Watch** function allows you to monitor both bands at the same time.
- **1.5 watts on 2 meters and 70cm: 5 watts when operated on 12 VDC (or PB-8 battery pack).**
- **Large dual multi-function LCD display.**
- **10 memory channels** for each band stores frequency, CTCSS, repeater offset, frequency step information, and reverse. A lithium battery backs up memories. Two memories for "odd split" operation.
- **Selectable full duplex operation.**
- **Extended receiver range:** 141–163.995 and 438–449.995 MHz; transmit on Amateur band only. (Modifiable for MARS and CAP. Permits required. Specifications guaranteed on Amateur bands only.)
- **Uses the same accessories as the TH-25AT (except soft cases).**
- **Volume and balance controls, plus separate squelch controls on top panel.**
- **Super easy-to-use!** For example, to recall memory channel, just push the channel number!
- **CTCSS encode/decode built-in!**
- **Automatic Band Change (ABC).** Automatically switches between main and sub band when signal is present.
- **Automatic offset selection on 2 meters.**
- **Tone alert system for quiet monitoring.** When CTCSS decode is on, the tone alert will function only when a signal with the proper tone is received.
- **Four ways to scan,** including ***dual memory scan,*** with time operated or carrier operated scan stop modes, and priority alert.
- **Automatic battery saver circuit extends battery life.**

- **Supplied accessories:** Dual band rubber-flex antenna, PB-6 battery pack, wall charger, belt hook, wrist strap, water resistant dust caps.

Optional Accessories

- **PB-5** 7.2 V, 200 mAh NiCd pack for 1.5 W output • **PB-6** 7.2 V, 600 mAh NiCd pack • **PB-7** 7.2 V, 1100 mAh NiCd pack • **PB-8** 12 V, 600 mAh NiCd for 5 W output • **PB-9** 7.2 V, 600 mAh NiCd with built-in charger • **BC-10** Compact charger • **BC-11** Rapid charger • **BT-6** 6-cell AA battery case • **DC-1/PG-2V** DC adapter • **HMC-2** Headset with VOX and PTT • **SC-22 and SC-23** Soft case • **SMC-30/31** Speaker mics. • **WR-1** Water resistant bag.

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2

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Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Kenwood transceivers and most accessories.

KENWOOD

The HT with More!

- Priority alert function.
- Large, easy-to-read multi-function LCD display with night light.
- Audible beeper to confirm keypad operation.

DTMF monitor also included.

- **BT-5:** AA cell manganese/alkaline battery case
- **BC-7:** rapid charger
- **BC-8:** compact battery charger
- **SMC-30:** speaker microphone
- **SMC-32:** mini speaker microphone
- **SC-12, 13, 27:** soft cases
- **RA-3, 5:** telescoping antennas
- **RA-8B:** StubbyDuk antenna
- **TSU-4:** CTCSS decode unit
- **VB-2530:** 2m, 25 W amplifier (1–4 W input)
- **LH-4, 5:** leather cases
- **MB-4:** mobile bracket
- **BH-5:** swivel mount
- **PG-2V:** extra DC cable
- **PG-3E:** cigarette lighter cord with filter

TH-225A

The all new TH-225A brings you all the convenience of a mobile rig, with the portability of an HT.

- Five watt output battery pack (PB-12) supplied
- Odd split on all ten memory channels
- Six watts with 13.8 VDC input
- Wide receiver frequency range. Receivers from 141–163 MHz. Includes the weather channels! Transmit from 144–148 MHz. Modifiable to cover 141–151 MHz (MARS or CAP permit required).
- CTCSS encoder built-in. TSU-4 CTCSS **decoder** optional.
- 10 memory channels.
- Nine types of scanning! Including new **"seek scan" and priority alert.** Also memory channel lock-out.
- Intelligent 2-way battery saver circuit extends battery life.
- Easy memory recall. Simply press the channel number!
- DC input terminal for direct mobile or base operation.
- New Twist-Lok Positive-Connect locking battery case.
- Monitor switch to defeat squelch. Used to check the frequency when CTCSS encode/decode is used.

- Supplied accessories: Belt hook, rubber flex antenna, wall charger, DC cable, and dust caps.

Optional Accessories:

- **PB-1:** 12 V, 800 mAH NiCd pack for 5 W
- **PB-2:** 8.4 V, 500 mAH NiCd pack (2.5 W)
- **PB-3:** 7.2 V, 800 mAH NiCd pack (1.5 W)
- **PB-4:** 7.2 V, 1600 mAH NiCd pack (1.5 W)
- **PB-12:** 12 V, 500 mAH NiCd pack

TH-315A/TH-415A

- TH-315A covers 220–225 MHz, TH-415A covers 440–449.995 MHz.
- 5, 2.5, or 1.5 W output, depending on the power source. Supplied battery pack (PB-2) provides 2.5 W output.

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

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QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Astronaut Callsigns

Mission STS-37 will probably have an all-ham crew. Linda Godwin N5RAX and Steve Nagel N5RAW received their callsigns last July, and Jerry Ross has agreed to obtain his Novice license at least by the time STS-37 flies. At present, that will most likely be in March 1991. Other members of the crew are Ken Cameron KB5AWP and Jay Apt N5QWL.

According to our latest report from NASA, STS-35 will take off no earlier than August 30 and no later than September 14. STS-38 will slip to November. *TNX Gil Carman, NASA.*

Museum Exhibit

Tampa's Museum of Science & Industry, with the help of local hams, hams across the U.S., manufacturers, and the local Armed Forces Communications and Electronics Association (AFCEA) chapter in Tampa, Florida, has built a working ham radio station on the premises. For several years, Clark Evans WA4DLL worked persistently to accomplish this, finally enlisting the moral support of prominent hams such as retired Senator Barry Goldwater K7UGA and publisher Wayne Green W2NSD. Letters from these men coupled with the efforts of others helped secure the museum administration's support.

Yaesu donated a complete top-of-the-line station and many accessories. Mosley Antennas chipped in with a 3-element yagi array, and Stewart Schneller K4JOP, a local ham, donated a 30-foot tower. Schneller and other hams also donated many hours of labor to install the station.

Daily, volunteer operators from the MOSI Radio Club are introducing Bay Area youngsters to worldwide HF amateur communications, and encouraging them to take up the hobby. *TNX Greg Grambor WB2GMK.*

Flexibility in Testing

Volunteer Examiners may now use more flexible procedures in testing the handicapped or disabled provided the candidate presents a doctor's letter describing the disability.

The procedures are, *only where warranted:* 1. A sending test (instead of a receiving test). 2. Pausing the tape to allow the candidate to *speak* what he has copied. More specifically, *where warranted,* volunteer examiners may pause the tape after: phrases/sentences; groups of words; individual words; or, in extreme cases, single letters.

If the above accommodations do not overcome the handicap or disability, the candidate can send the FCC a Waiver Request Letter and a Doctor's Certification letter, in prescribed FCC format, for waiving the 13 or 20 wpm requirement. (The 5 wpm requirement may *not* be waived.) The decision to grant a waiver is the prerogative of the FCC.

For more information and sample forms, see the August 1, 1990 issue of the *W5YI Report,* or contact your local VE team. *TNX Barbara Weirich KB2IWN for sending the ARRL letter, and the* W5YI Report *for additional information.*

Six Meter Plan

Southern California has adopted a new 6 meter band plan. Last March the Southern California Repeater and Remote Base Association sponsored a meeting in Anaheim, California, which was attended by representatives of all Southern California 6m band users' groups. After much discussion, they unanimously adopted a 50–54 MHz band plan.

Highlight of the new plan is a "modular" approach. (Based on Rule Making [RM] petitions from Southern California, the FCC had increased the repeater spectrum on 6 meters from 52–54 to 51–54 MHz.)

Recognizing that the pattern of band use for repeater communications depends on whether TV channel 2 (54–60 MHz) is broadcasting, the Southern California plan divides the 51–54 MHz repeater spectrum into three 1 MHz blocks. Each block will be coordinated separately, contain simplex and special-use channels, and have an input/output spacing of 500 kHz; inputs in the lower 500 kHz and outputs in the higher. The primary FM simplex will remain 52.525 MHz. The plan for the first megahertz of the band, 50–51, generally follows established practice. For details and a copy of the band plan, contact SCRRBA, P.O. Box 5967, Pasadena CA 91117. *TNX John Haserick W1GPO.*

Twenty Meter Trouble

The FCC has received many responses to its request for a plan to resolve the interference, controversies, and prolongued on-the-air rantings surrounding net, phone patching, and bulletin operations, especially on the above band.

This is the second phase of the inquiry. Last year the FCC mailed a fact-finding letter to 19 net and bulletin service participants. Based on the responses, the agency mailed another letter to nine net managers, asking them to come up with a plan. FCC Special Services Division Chief Robert McNamara warned that if the FCC had to intervene to solve the problems, it could result in "additional restrictions that may affect all amateur operators."

Regarding the responses from the HF nets, FCC Personal Radio Branch analyst William Cross said that the letters indicate common areas, but disagreement on what action to take. But compared to last summer, the problem is subsiding. Some of the nets that left 14.313 have returned. Cross believes that the HF inquiry has raised general awareness of the rules.

Bulletins are a difficult regulatory area. Cross says the amateur community has to decide for itself, rather than ask the FCC to discriminate among stations. At present, the FCC is continuing to study the responses and trying to find out whether or not there is any agreement about what actions should be taken. *TNX W5YI Report.*

Ham Memorial

A granite monument will be dedicated to honor hams who died while performing in a civilian amateur radio public service communication network. The dedication ceremony will be on August 25, 1991, at the ARRL Convention in Saginaw, Michigan. The name, call, date of death, and the event in which the amateur was participating at the time of death, will be engraved on the monument.

If you know of someone who should be included on the monument, please send a nominating statement to: Monument Committee, 1991 National Convention, %J. Turner K8CQF, 423 N. Granger St., Saginaw MI 48602. Your statement should include the complete name of the deceased, their call at the time of death, the date of the death, a brief description of the circumstances surrounding the death, and supporting evidence, such as media reports and testimonials.

Construction of the monument will cost about $20,000. If you wish to contribute, make your check payable to the National Monument Fund.

Forty Meter Move?

Frequencies on the 40 meter band may be moved to keep the band from being lost to other service interests. Radio Netherlands' "Media Network" reported July 5 that negotiators for amateur radio interests have agreed on a possible re-alignment of 40 meter sharing with international broadcasting use. The U.S. Industry Advisory Committee Working Group tentatively agreed to propose to the FCC that amateur allocation be moved down to 6.950–7.250 MHz on an exclusive basis worldwide. International shortwave broadcasters would then move up to 7.250–7.750 MHz on the same basis.

The FCC will take the proposal into account, along with proposals from other spectrum users, to prepare the papers on the position of the U.S. at the WARC '92 and '93 conferences. If accepted, the move may lessen interference to amateur communications on that band—*if* international broadcasters abide by the agreement. On the other hand, it would render many pieces of ham gear obsolete. At the least, it would give amateurs the opportunity to re-evaluate how or whether they want to partition the band by mode.

The FCC could ignore the proposal or suggest a modified version. After that, it's off to the Plenipotentiary of the International Telecommunications Union, where each nation holds one vote on every issue. This is where the survival of 40 meters—and possibly other amateur radio allocations—will be determined. This is also where amateurs have the least influence, since they are not directly represented and can only lobby for their interests. *TNX Westlink Report, July 20, 1990.*

AEA ...Brings You A

Keyers

The Morse Machine MM-3 Keyer

The Morse Machine has all the features you need in a memory keyer, including 2 to 99 WPM speed selection and over 8,000 characters of soft-partitioned memory. Twenty memories store your messages...as short or as long as you like. Memory can be expanded to 36,000 characters. All memory is backed up by an internal lithium battery.

Comprehensive Morse training facilities are built-in. **A Proficiency Trainer** for random code group practice. **A Random Word Generator** which generates four-letter words and **A QSO Simulator** which allows you to call stations, answer a CQ or listen to realistic on-the-air QSO's.

The MM-3 also features automatic serial number insertion and incrementing in any memory message. Use the front panel knob to adjust your sending speed or enter a precise speed with the keypad, toggling between the two at any time. Exchanges can be expedited by having parts of your message sent at a higher speed. You can even add remote switches for four of the memories to send your response or call CQ. The MM-3 can also be programmed for automatic beacon use. The RS-232 compatible serial I/O port provides computer control of the MM-3 and monitoring of the Morse training features.

Packet

PK-88 Packet Radio TNC

Unique operating features with a proven hardware and software design make AEA's PK-88 your best choice in packet radio--now with MailDrop, an 8KByte efficient personal Mailbox. The PK-88 also allows multiple single frequency QSO's, digipeating and networking. It's a superb value, packed with all the most needed packet radio features such as direct interface capability with NET/ROM and TCP/IP. In addition to all the features of a "standard" TNC, the PK-88 offers features not found in any other TNC:

- WHYNOT command - Shows reasons why some received packets are not displayed.
- "Packet Dump Suppression" - Prevents dumping unsent packets on the radio channel when the link fails.
- CUSTOM Command - Allows limited PK-88 customization for non-standard applications.
- Enhanced MBX command- Permits display of the data in I- and UI-frames, without packet headers and without packet headers or retried frames.
- Enhanced MPROTO command - Suppresses display of non- ASCII packets from Level Three switches and network nodes.

Multi-Mode

PK-232MBX Multi-Mode Data Controller

With over 40,000 units sold worldwide, the PK-232MBX is the world's leading multi-mode data controller. Combining all amateur data communication modes in one comprehensive unit, the PK-232MBX offers Morse Code, Baudot, ASCII, AMTOR/SITOR 476 and 625, HF and VHF Packet, WEFAX receive and transmit, TDM, as well as commercial standard NAVTEX automated marine information services.

All software is on ROM.

- 20 front panel status and mode LED indicators
- RS-232 compatible
- Exclusive SIAM™ Signal Identification and Acquisition Mode
- TDM Time Division Multiplex decoding
- PakMail™ mailbox with selective control of third-party traffic
- FAX printing - supports most printers
- Two radio ports
- Host mode for efficient program control of the PK-232MBX
- KISS mode for TCP/IP networking protocol compatibility
- 32K RAM lithium battery-backed
- Many features for the digital SWL

Antenna Tuners

AT-300 and AT-3000 Antenna Tuners

For tuning perfection, choose AEA's AT-300 (300 watt) or AT-3000 (3 kW) antenna tuners. Quality and exceptional engineering are built-in for maximum performance and long operating life.

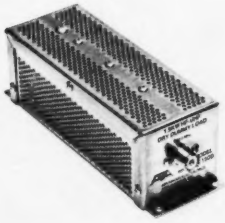
The low-pass design provides more harmonic attenuation for lower TVI and allows matching to a much wider range of antenna impedances than common high-pass designs.

The AEA tuners feature a frequency compensated dual-movement SWR meter for ease of tuning with a front panel power range switch. Minimal SWR is achieved by inductors with 18 (AT-300) and 20 (AT-3000) taps. AEA's exclusive patent pending CAM switch design on the AT-3000 provides accurate tuning. The built-in front panel antenna switch allows you to easily select two unbalanced (coax-fed) antennas, a dummy load or a balanced antenna.

Advanced Electronic Applications, Inc. 2006-196th St. SW/P.O. Box 2160 Lynnwood, WA 98036 206-775-7373

Better Experience

Dummy Load

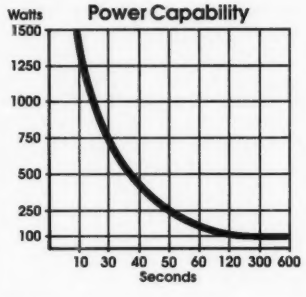


DL-1500

DC-650 MHz Up to 1500 Watts

AEA's dry dummy load simulates a perfect 50 ohm antenna up to 650 MHz so you can test your transmitter without radiating a signal on the air.

- DC-650 MHz
- Simulates matched 50 ohm transmission line to test your transmitter
- Handles short-term RF power up to 1500 watts
- VSWR of less than 1.3:1 at 650 MHz
- Compact and lightweight
- Air cooled dry load



Econo Tuner

ET-1 Antenna Tuner

300 Watts of All-Band Tuning

Meet your match with AEA's new ET-1 Econo-Tuner™. A quality, economical antenna tuner for under $150, the ET-1 Econo-Tuner is designed to match virtually any receiver, transmitter or transceiver from 1.8 to 30 MHz with up to 300 watts of RF power.

Compatible with almost ANY antenna including verticals, dipoles, inverted vees, beams and mobile whips that are fed by coax cable, balanced lines or a single wire. For easy connection to balanced lines, a 4:1 balun is built-in.

A front panel switch control allows you to switch between two coax-fed antennas (direct or through the tuner). You can also switch to a balanced line or wire antenna. The BYPASS position allows you to switch to a dummy load (such as AEA's DL-1500 dry dummy load) or a direct connected coax antenna. In the BYPASS position, COAX 1 OUT or COAX 2 OUT can be selected so that the tuner is bypassed, but not the meter circuit.

The ET-1 features a precision dual-movement meter to simultaneously monitor power and SWR.

Unique engineering designs have made AEA one of the leading innovators in the amateur radio industry. That same quality and superior technical support make the ET-1 your best deal for an antenna tuner.

Antennas

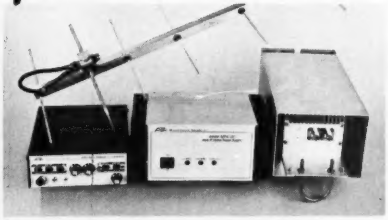
IsoPole™ Omni-Directional VHF and UHF Base Station Antennas

An outstanding mechanical and electrical design make the IsoPole the best choice for an economical omni-directional VHF or UHF base station antenna. All IsoPole antennas yield the maximum gain attainable for their respective lengths and a zero degree angle of radiation which puts the most signal on the horizon. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Decoupling cones offer great efficiency over obsolete radials which radiate in the horizontal plane. The IsoPoles also have a broader frequency coverage than any comparable antennas. Typical SWR is 1.4 to 1 or better across the entire band!

All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion-resistant aluminum alloys. Aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast, not supplied).

IsoPoles are ideal for packet radio. The decoupling cones stop computer hash picked up by the outer shield of the coaxial cable from being passed to the receiver.

Amateur TV



AEA's New ATV System

Add a new dimension to your amateur radio communications with AEA's Amateur Television (ATV) system. If you hold at least a technician-class license, you can transmit and receive live or taped audio and video Fast-Scan TV (FSTV) information that rivals broadcast quality. Now you can share more than conversation over the air with this new mode of "personal communications."

It's Easy and Inexpensive. If you have a video camera or camcorder and a standard TV set, you may already own the most expensive components of an ATV system. AEA's ATV system includes a transceiver and antenna. Simply connect the camera, TV and the antenna to the transceiver, and you're on the air LIVE with one watt P.E.P.! If you want to broadcast with more power, AEA also offers a 50 watt mast-mounted linear amplifier and GaAsFET preamp with power supply. Your TV set will monitor your transmitted and received pictures.

Specifications subject to change without notice or obligation. Dealer inquiries invited. Copyright 1990.

CIRCLE 65 ON READER SERVICE CARD

Dual Voltage Bench Supply

Versatile solution for your power supply needs.

by Hugh Wells W6WTU

When I get involved in projects, I never seem to have enough power supplies to go around. When one's available in my shack, it's usually the wrong voltage, or it lacks a feature I need for the project. Building this versatile supply solved my power supply problems.

Multiple Applications

This power supply provides a fixed 5-volt output suitable for TTL logic and a variable voltage output ranging from about 1.2 volts to 21 volts, which is suitable for almost anything else. In addition, variable current-limiting protects the power supply components and the project.

For example, you can set the maximum desired current for charging a NiCd battery. You can also use it to tune up an RF power amplifier, since it's desirable to limit the maximum circuit current draw to a safe value to protect the transistor.

You can measure current and voltage with one meter. Two meters may be more convenient for simultaneous measurements, but this one is easily switched. If you buy all the parts new, the supply costs about $53.

When switched to *current*, the meter indicates the total current drawn from both the fixed and variable circuits. In the *voltage* position, the meter indicates the voltage output only from the variable regulator.

The Circuit

The power supply was designed around the ever-popular LM317 and LM340-5 (7805), three-terminal regulator ICs. See Figure 1. In Figure 2, a pictorial wiring diagram gives a conversion perspective from a schematic to the actual hardware wiring. Color-coded wires in the diagram indicate the circuit relationship between the schematic and pictorial diagrams. See the table for a separate component listing.

The operation of each regulator is conventional for three-lead devices, except for the current-limiting feature added to the LM317 circuit.

The LM317

Before describing the current-limiting feature of the supply, it is worthwhile reviewing the voltage control characteristic of the LM317. The three terminals of the LM317 regulator are INPUT, OUTPUT, and ADJUST. At the lowest regulated output, the voltage differential between the INPUT and OUTPUT terminals must not exceed 40 volts. In other words, the power transformer's output must not exceed 28 Vrms, which at peak would produce 40 VDC across capacitor C6. Typically, an 18–26.5 volt transformer would be used with the LM317. When the output voltage is adjusted to the highest amount, the voltage differential from input-to-output of the regulator is at the lowest possible value. At that time, the regulator must have an input-to-output differential (headroom) of at least 3–4 volts to remain in regulation.

The third terminal, ADJ, of the LM317 is for controlling the input-output voltage differential to a value below the maximum regulated output voltage to a minimum of 1.2 volts. Regardless of the output voltage, approximately 1.2 volts (essentially constant) will be automatically developed between the ADJ and OUT terminals. If the ADJ terminal is allowed to float (open circuit) along with the output terminal, the output voltage wili rise to

Photo A. Front panel of the supply.

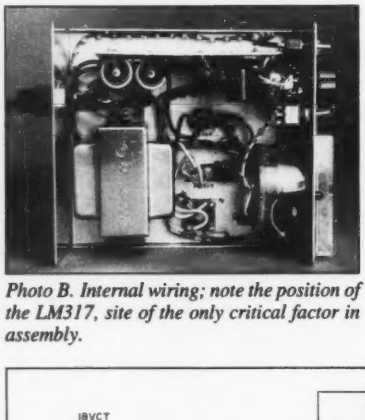


Photo B. Internal wiring; note the position of the LM317, site of the only critical factor in assembly.

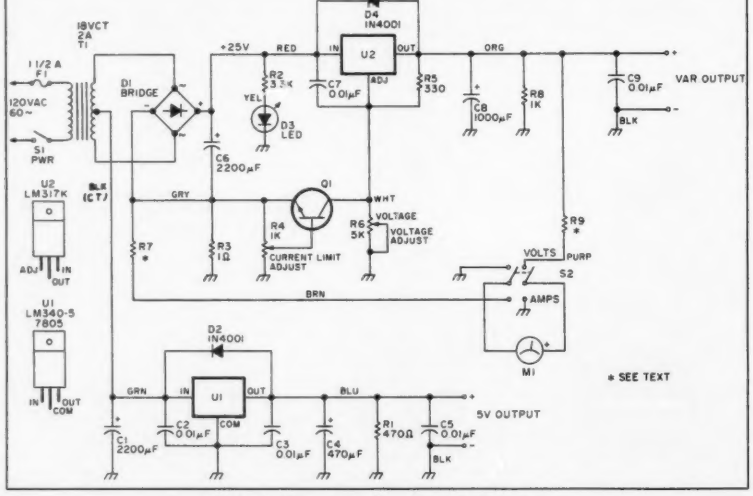


Figure 1. Power supply schematic diagram.

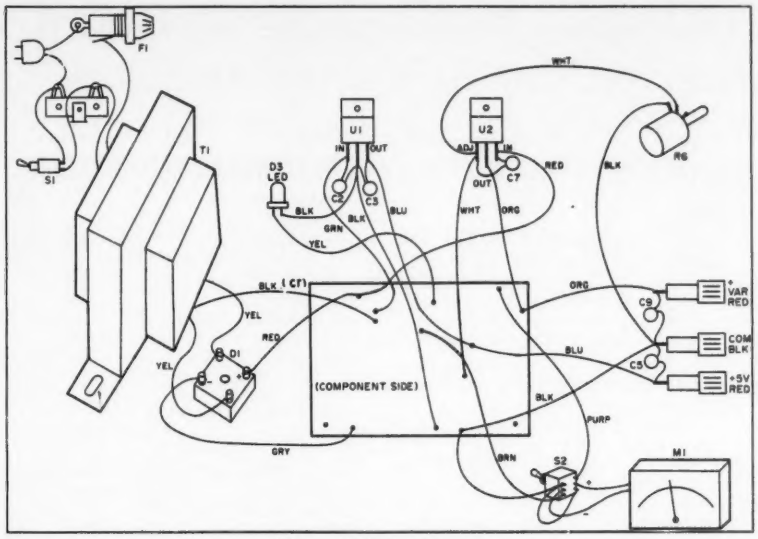


Figure 2. Wiring diagram.

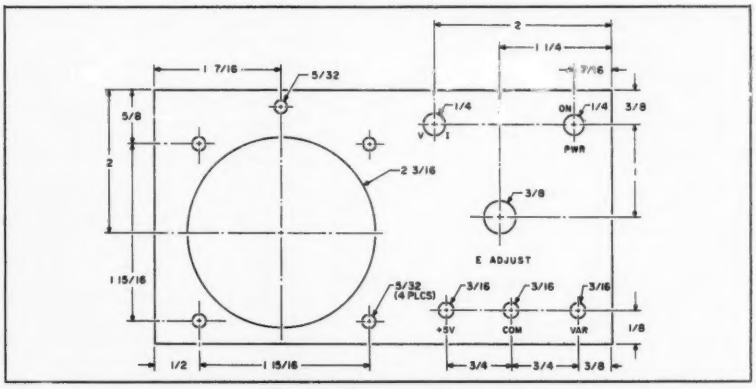


Figure 3. Front panel layout.

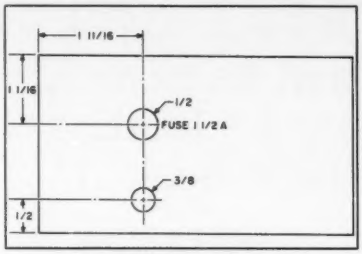


Figure 4. Rear panel layout.

pull-down of the ADJ terminal. In operation, as the supply current rises, so does the transistor's base-emitter voltage. As it approaches 0.7 volts, the transistor begins to conduct and begins pulling down on the ADJ terminal. The power supply output current remains essentially constant under limit-control even though the output voltage decreases as ADJ is pulled down.

For my power supply, I selected a horizontal, open-case, TV-type current-limit adjust pot, mounted flat on the circuit board. However, you could mount a pot with a shaft on the power supply's front panel for accessibility.

Another feature of the supply is reverse bias protection for the regulator ICs, accomplished by diodes D2 and D4. Most solid state regulators require the input voltage to remain higher than the output voltage as long as power is applied. Under normal conditions, this is fine. However, under some operating conditions, the supply power could accidentally be terminated, causing the regulator's input voltage to fall faster (to a lower value) than the output voltage.

This might occur when large value capacitors or NiCd batteries are attached to the supply's output terminals. A few moments after power loss, the regulator could be subjected to a reverse bias, resulting in internal

maximum and regulation will not occur, but the 1.2 volts will still be present between the ADJ and OUT terminals.

Regulation begins to take place only when the ADJ terminal is pulled down, causing the IC to maintain a 1.2 volt differential between the ADJ and OUT terminals. With a pot connected between ADJ and ground, the power supply output can be controlled (regulated) from 1.2 volts up to about 4 volts less than the DC input voltage to the regulator. In other words, if the maximum unregulated input is 25 volts, the regulated output would be 21–22 volts.

Now, to limit the output current of the power supply, it is only necessary to pull the ADJ terminal toward ground when a selected current value has been reached. You do this by passing the total supply current through a 1-ohm resistor which will produce a 1-volt drop per amp of current flow. Placing a pot across the 1-ohm resistor allows a specific voltage, as a function of current, to be selected and supplied to the base-emitter junction of an NPN transistor.

This voltage, in turn, is used for electronic

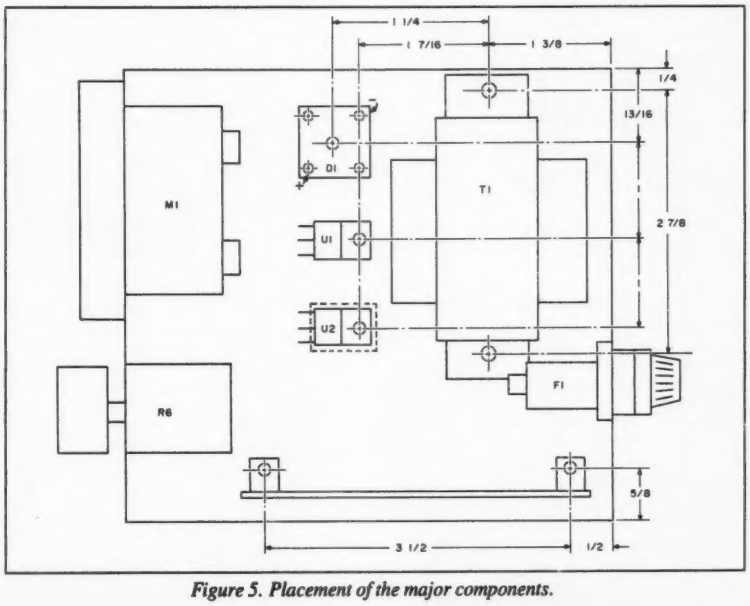


Figure 5. Placement of the major components.

MFJ gives you *all 9* digital modes

and *keeps on* bringing you state-of-the-art advances

. . . while others offer you *some* digital modes using 3 year old technology!

MFJ-1278

$279.95

No 3 year old technology at MFJ!

Using the latest advances, MFJ brings you 9 exciting digital modes and *keeps on* bringing you state-of-the-art advances like new ASA™.

You get tons of features other multi-modes just don't have.

Only MFJ gives you *all 9* modes

Count 'em -- you get 9 fun modes -- Packet, AMTOR, RTTY, ASCII, CW, FAX, SSTV, Navtex and Contest Memory Keyer.

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Tests in ***Packet Radio Magazine*** prove the modem used in the MFJ-1278 copies HF packet more accurately than all other modems tested.

MFJ-1278 is the *only* multi-mode with a ***true*** DCD circuit. This dramatically reduces sensitivity to noise and dramatically increases completed QSOs.

Exclusive Built in Printer Port

Only the MFJ-1278 has a dedicated printer port that lets you plug in your Epson or IBM compatible printer.

You don't need to buy a silly $40 cable just to plug in your printer.

20 LED Precision Tuning Indicator

MFJ's unequaled tuning indicator makes it really easy to work HF packet. Unlike others, you use it the same for all modes -- not different for each mode. Just tune your radio to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

New Easy Mail™ Personal Mailbox

You get MFJ's new Easy Mail™ Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

Multi-Gray Level FAX/SSTV Modem

You'll see tomorrow's news today when you copy outstanding FAX news photos with crisp clear details. MFJ-1278 is the *only* multi-mode with a built-in multi-gray level modem. It lets you transmit and/or receive multi-gray level pictures with an appropriate terminal program.

MFJ's new Automatic Signal Analysis™ gives you *exclusive* HF packet idenification!

NEW! **MFJ's** new ASA automatically identifies HF packet, RTTY, ASCII and AMTOR signals. A quick "OK" command selects the mode!

One FREE Upgrade!

When you buy your MFJ-1278 *today*, you don't have to miss new modes and features that come out *tommorow*. **Why?** Because your 1278 comes with a coupon good for one ***free*** eprom upgrade exchange that'll add new features.

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Plus you get . . . 32K RAM, ***free*** AC power supply, Host mode that lets MFJ-1278 serve as a kiss interface or dumb modem, fast throughput anti-collision technology, independent transmit level for each radio port, random code generator, lithium battery backup, RS-232 *and* TTL serial ports, socketed ICs, tune up command, peripheral I/O port, automatic serial numbering, programmable message memories, dual radio ports (*each* HF or VHF), CW paddle jack, audio amplifier and speaker jack so you can monitor CW sidetone, transmit and receive audio and packet connect bell, ***new*** fully intergrated instruction manual with *Fast Start*™ booklet and more. 9½ x 9½ x 1½ inches.

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MFJ-1278T

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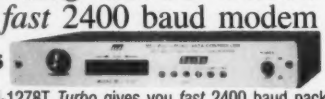

The new MFJ-1278T *Turbo* gives you *fast* 2400 baud packet -- *twice* the baud rate of any other multi-mode. By communicating faster you'll reduce chances for error, lessen congestion and more efficiently utilize our ham frequencies. You'll also get 1200/300 baud for compatibility with older TNCs.

The 2400 baud modem is also available separately. Order MFJ-2400, $69.95, for any MFJ and most other TNCs.

Software Pack gets you on the air *instantly!*

MFJ software packs with interface cable get you on the air instantly if you use an IBM compatible, Commodore or Macintosh computer. Here are some of the programs available:

MFJ-1289, $59.95. Menu driven. Super IBM compatible program. See ad below for details.

MFJ-1282B, $39.95. New with multi-gray receive for Commodore 64/128. Menu driven.

MFJ-1287, $24.95. Macintosh starter pack.

MFJ Packet Radio

MFJ-1274

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MFJ-1270B

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A new KISS interface lets you run TCP/IP and MSYS. NET ROM compatible.

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New 2400 baud ***Turbo*** models available: **MFJ-1270BT,** $209.95; **MFJ-1274T,** $229.95.

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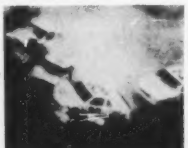

High resolution AP news photo received on 20.738 MHz using MFJ MultiCom and MFJ-1278 with multi-gray modem.

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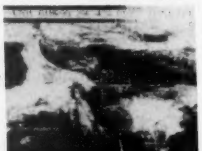

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regulator damage. By placing a diode from the output to the input terminal of the regulator, the regulator is protected; the input terminal voltage can never fall more than about 1 volt below the output terminal.

Metering

For displaying the voltage and current, I installed a 2½-inch plastic case 0–1 mA meter, which I had obtained from a local swap meet, on the front panel. However, nearly any panel meter having a full-scale current value of 10 mA or less (preferably less) will work as long as multiplier resistors R7 and R9 match the meter sensitivity and provide full-scale voltage/current value.

I found it desirable to use two resistors in series to obtain R7, and three resistors in series for R9. The 0–1 mA meter's sensitivity is 1000 ohms/volt; for a 20-volt, full-scale reading, resistor R9 would be nearly 20,000 ohms with an actual value of about 19,120 ohms. The value can be made by series connecting three resistors having values of 15,000, 3,300, and 820 ohms. If needed, you can add new scale markings to the dial face with a very fine point, felt tip pen. The scale could be marked 0 to 20 to accommodate both the 0–2 and 0–20 ranges.

If you select the Radio Shack 0–15 volt panel meter, you can use it as is for a voltage range of 0–15 volts and a current range of 0–1.5 amps. In other words, the multiplier resistor provided with the meter will satisfy the value R9 needs. However, for the current measurement, the value of R7 (approx. 1KΩ) would have to be determined to provide a full-scale current value of 1.5 amps. It would also be necessary to re-mark the dial face for full-scale values different from those provided by the 0–15 indication. *[Ed. Note: A 20k pot can be substituted for R9 and a 2k pot for R7.]*

Construction

Before assembling the power supply, I drew full-size layouts of the chassis and hole patterns as shown in Figures 3, 4, and 5. The drawings provided me with a clear picture of how things were going to fit together before I drilled any holes.

Figure 6a is a drawing of the printed circuit board for mounting the components. You can make a printed circuit board from the drawing, or use perforated board material, as indicated in the parts list. Either way, the board material is fastened to the chassis with two ½-inch long, 1/32-inch thick aluminum "L" brackets cut and bent from scrap material. Figure 6b shows parts placement.

The only critical item in assembly concerns the insulation (plastic or mica) and the thermal grease placed between the LM317 and the metal chassis. Care must be taken to remove any burrs from around the mounting screw hole to prevent a short from occurring between the LM317 mounting tab and the chassis. The regulator tab remains electrically isolated from the chassis, but it must be in close enough contact with the chassis to transfer heat readily.

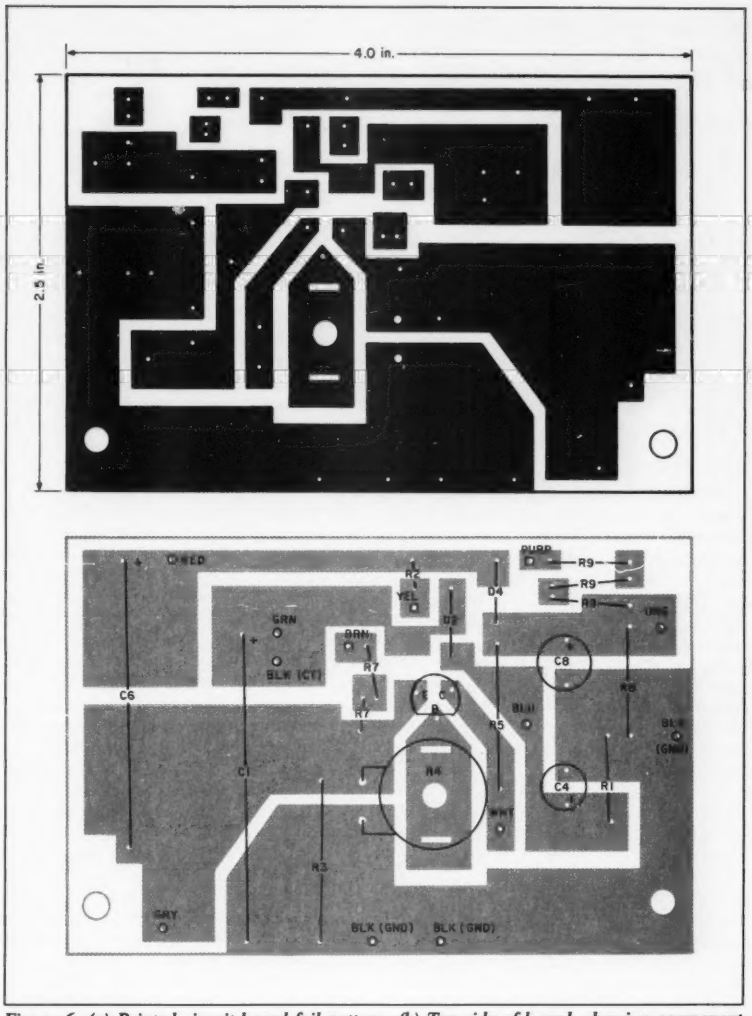

Figure 6. (a) Printed circuit board foil pattern; (b) Top side of board, showing component placement.

You must also use thermal grease when mounting the 5-volt regulator to the chassis. An insulator is not required, as the LM340-5 tab is intended to be grounded.

Mount the power-on LED in the small space above the meter. Because of the limited space, I glued the LED into a 5/32" hole drilled into the panel.

Conclusion

Since building this power supply, many of my project troubles have vanished. Having one supply for both fixed and variable voltages is extremely convenient, and the current-limiting feature has saved many projects.

The Dual Voltage Bench Supply

Quantity	Reference	Description
1	R1	470 ohm ½W resistor
1	R2	3.3K ¼W resistor
1	R3	1 ohm 10W resistor, RS 271-131
1	R4	1k pot, RS 271-227/333
1	R5	330 ohm ¼W resistor
1	R6	5k linear pot, RS 271-1714
1	R7	meter multiplier (see text)
1	R8	1k ½W resistor
1	R9	meter multiplier (see text)
2	C1,6	2200 µf 35V axial lead cap, RS 272-1020
5	C2,3,5,7,9	0.01 µf 50V disc cap, RS 272-131
1	C4	470 µf 16V radial lead, RS 272-957
1	C8	1000 µf 35V radial lead, RS 272-1032
1	D1	2–10A bridge rectifier, RS 276-1185
1	D2,4	IN4001 1A diode, RS 276-1101
1	L1	Red LED, RS 276-041
1	U1	LM340-5/7805 regulator, RS 276-1770
1	U2	LM317K regulator, RS 276-1778, ECG 956
1	M1	Panel meter (see text) RS 270-1754
1	F1	panel mount fuse holder, RS 270-364A
1	—	1½A fuse 3AG, RS 270-1283/1284
1	S1	SPST min switch, RS 275-624
1	S2	DPDT min switch, RS 275-626
3	—	5-way binding posts, RS 274-662
1	—	2 terminal barrier strip, RS 274-688
1	—	line cord, RS 278-1255
1	—	knob, RS 274-416
1	—	chassis, RS 270-253A
1	T1	power transformer 18V 2A, RS 273-1515
1	—	perfboard, RS 276-158

An etched and drilled PC board is available for $4.85 + $1.50 postage from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

73 Review

by Bill Brown WB8ELK

The Signal Sentry

Miniature touch-tone decoder and message alert.

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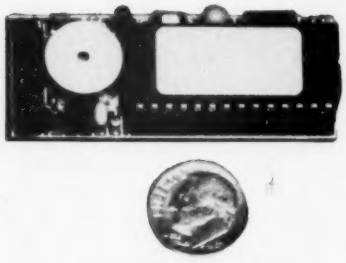

Photo A. The Signal Sentry.

The Signal Sentry is a microprocessor-controlled miniature touch-tone decoder. With a four-layer circuit board and compact layout, it measures just 2¼"L x 15/16"W x 7/16"H. It's small enough to fit inside of most 2 meter rigs and some larger HTs.

Why a Microprocessor?

The Signal Sentry is primarily used as a message alert system. It has a built-in LED and beeper that can be controlled via a touch-tone sequence. You can enter up to eight different alert notification numbers into its memory. With the Sentry hooked up to your rig, you don't have to listen to dozens of conversations while waiting for a call. All your friend has to do is send out your notification sequence on his touch-tone pad to alert you. Not only can the caller alert you of his presence, he can indicate the urgency of the call by pressing one of the letter keys on the pad at the end of the sequence. The urgency levels are D (informal level, 1 beep), C (important level, 2 beeps), B (urgent level, 3 beeps) and A (emergency level, 4 beeps repeated continuously).

The Sentry has a power-saver circuit that puts it to sleep after 30 seconds of inactivity on your monitored frequency. This reduces the current drain to an incredibly low 12 microamps. Whenever audio is detected, the Sentry is awakened via a MAXIM 666 audio detect IC. The average current drain during operation is still a very low 3 milliamps. Whenever the Sentry is awakened, it will tell you whether it has received an alert signal (and its priority level) via the LED or beeper.

One particularly nice feature is that a caller can also include a number ID at the end of the alert sequence. This requires some fairly long tone combinations by the sender. However, the ID number is sent out in Morse code by the LED or beeper whenever the Sentry is awakened. Not only can this circuit let you know that someone tried to contact you, it can also tell you who left the message!

The Manual

I recommend that you carefully read the manual several times. I found the whole thing incomprehensible the first time I read it. It took about three times through to finally figure out all of the features this circuit is capable of doing. I understand that the manual will be rewritten in the near future, however.

The section on readjusting the priority levels can be confusing. You can readjust the priority level to indicate messages with just an LED flash instead of the beeper. This requires hitting the reset button in the right sequence.

Also, programming in your ID numbers and other options requires you to have a "buddy" to send them over the air while you hold down the onboard switch. You can do this yourself if you have two rigs and THREE hands! Fortunately, you can add an external switch to one of the plugs on the circuit board and solve this problem (or you can just short out the switch during the programming sequence). Requiring you to hold down the switch was meant as a security feature so that others couldn't reprogram your Sentry over the air remotely. In fact there is an option sequence that allows you to program the Sentry without holding down the switch.

One problem may occur with owners of earlier model HTs. You need a 16-key touch-tone pad with the A–D key buttons to signal the Sentry! It would be nice to allow a shorter access code, particularly when using the Sentry as a radio remote controller. Presently this is not an option.

More Features

Although intended primarily for a message alert system, the Signal Sentry is also a very compact, lightweight touch-tone decoder that can be used to remotely control any piece of equipment. You do have to provide a transistor or logic interface to control external devices (See Figures 1 and 2). Two external devices can be separately controlled via the AUX1 and AUX2 output pins. To use the Sentry in this mode you must first configure it for continuous operation as its auxiliary outputs will reset when it goes to sleep mode. It still only draws 3 milliamps in continuous operation mode! I tested the unit out in this mode quite extensively to remotely control my ATV transmitter at my house while I drove around looking for hot reception sites. Even under marginal signal conditions, I could always bring up the transmitter. Although it would've been nice to control the rig with a shorter tone sequence, it does add a level of security.

One last feature to round out a powerful package: If you add a CMOS to RS-232 level converter IC, you can actually send serial data of all incoming touch-tones directly to a computer.

All in all, the Signal Sentry is one feature-packed device! You'd be hard pressed to find a more reasonably priced, compact, low power touch-tone decoder; not to mention one with a built-in microprocessor!

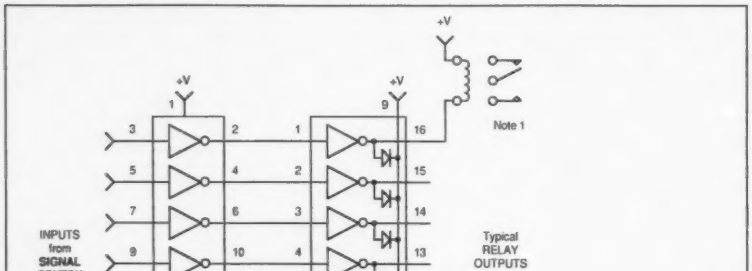

Figure 1. Interface for multiple output control.

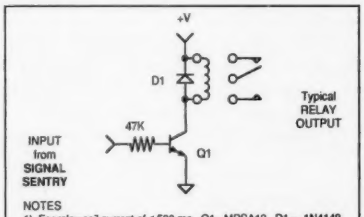

Figure 2. Interface for single output control.

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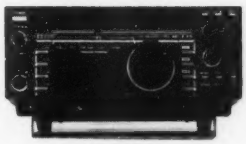

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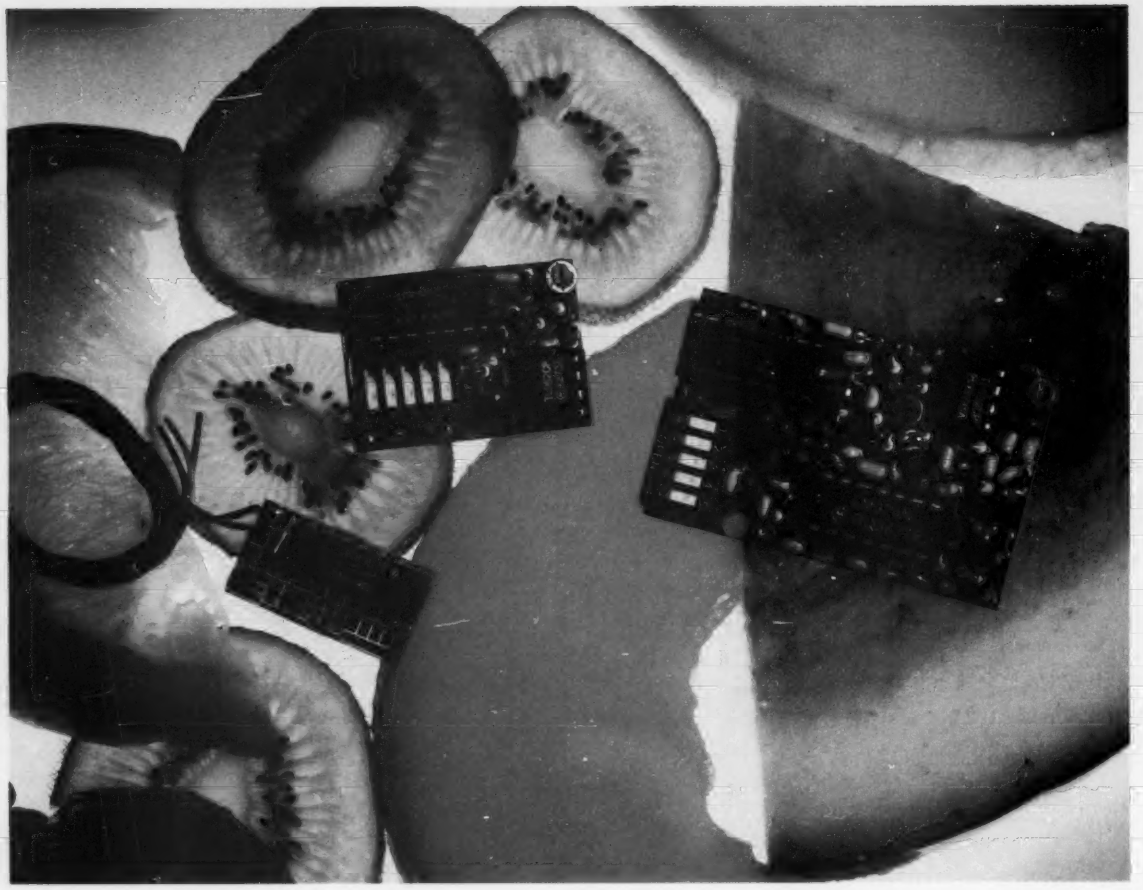

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1 Letters
2 Never Say Die
3 Dual Voltage Bench Supply
4 Review: The Signal Sentry
5 Ham Profiles
6 Review: The Yaesu FT-1000 Transceiver
7 The SPC Transmatch
8 Review: Antenna Quick-Launch System
9 ROBO-COPY
10 An Easy to Make 2 Meter Antenna
11 Solar Car Race
12 Review: Gap DX-VI Multiband Verticle
13 Service Survey Wrap-Up
14 ZED Loop Special
15 A Visual CW Offset Indicator
16 DX
17 Homing In
18 ATV
19 Hams with Class
20 Ask Kaboom
21 Looking West
22 Above 'n' Beyond 2 Meters
23 Above & Beyond
24 Barter 'n' Buy
25 New Products
26 Special Events
27 Ad Index 10/90
28 Keyword Index 10/90
29 73 International
30 Updates
31 Hamsats
32 RTTY Loop
33 DXDA Country List
34 QRX
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36 Propagation
37 Random Output
38 Ham Help
39 QRP

HAM PROFILES

There are no "average" hams!

Now on the Air

Photo A. Stephanie Hassan KA3WMS stands near the Kenwood TS-140 she shares with her dad, Joe Hassan KA3RYY.

Stephanie Hassan KA3WMS of Sharon, Pennsylvania, passed her Novice exams last July. She and her dad, Joe Hassan KA3RYY—who, by the way, would like to express his thanks to Ed, their elmer—share the same station.

Besides her interest in amateur radio, 11-year-old Stephanie "collects cats," and would like to be a vet. She also collects stamps, and she enjoys bicycling and swimming.

Stephenie KA3WMS, a sixth-grader, is on the honor roll at school. In particular, she excels in math. *(TNX Joe KA3RYY.)*

Photo C. Reverend Gil Pries WA6RKD at his rig with some members of the Royal Rangers.

Inspirational Hamming

The Reverend Gil Pries WA6RKD of Los Angeles, blind since birth, taught himself to play the guitar and accordion before he was 10. In a recent article in the *Los Angeles Daily News*, WA6RKD was quoted as saying that his music ". . . was another way to communicate. When I play and sing, the music really seems to affect people." At 42, he is now a keyboard virtuoso as well, and he has produced an album of religious music.

In 1970, Gil WA6RKD graduated from Bethany College in Santa Cruz, California. Presently, Gil is minister at the First Assembly of God Church in Burbank, California.

One of Gil WA6RKD's greatest joys is the Royal Rangers. Sponsored by the Assemblies of God, Pentecostal, and other Christian churches, the Royal Rangers is a nationwide club for boys aged five to 17. Amateur radio, yet another way to communicate, is an activity Gil shares with the boys. *(TNX Bill Pasternak WA6ITF, with credit to the* Los Angeles Daily News *and the* Valley Good Guys ARC Gazette.*)*

Photo B. Michael Johnson N4YZW has a lot of fun with his HT.

Attention Getter

Michael Johnson's uncle, Andy Zorca WJ9J, challenged him to get his Technician Class license, promising him an HT if he did. For six months, eight-year-old Michael studied theory and code with his parents, Paul N4YGG and Althea N4YHY. Ten days after passing his Novice exams, he passed the Technician exams. He was very excited about getting his license in the mail so he could talk on his uncle's 440 repeater.

Michael N4YZW isn't shy about taking his HT anywhere and talking on it. Recently, in line at K-Mart with a friend, he talked to his father on the radio. His dad stated that he was several miles away, which elicited some curious stares. One child asked his mother, "Is that a real radio?"

On several occasions, someone has seen his radio at his side and asked, "Is that your walkie-talkie?" When he replies, "No, it's my HT," he gets bewildered looks.

Michael wants to upgrade to General soon, eventually getting his Extra Class. *(TNX Paul N4YGG of Hixson, Tennessee.)*

Prolific Teacher

Allen Wintersteen KL7IEI started a ham club at the high school in Bethel, Alaska, 12 years ago. Now he's in his second year of teaching radio fundamentals to students in the Kilbuck school.

This year's new crop of hams are: Joshua Morris WL7BWL; Ty Hulse WL7BWR; Muddassir Aliniazee WL7BWG; Denise Cambell WL7BWN, Julien Jacobs WL7BWF, Sara Elsworth WL7BWT, Kip Hulse WL7BWS, Sterling Graham WL7BWO, Brandon Power WL7BWQ, Yvonne Mockta WL7BWM, Jaclyn Mojin WL7BWX, Christy Helper WL7BWP, Danny Helper WL7BWP, Davy Helper WL7BWV, Edwin Hahn WL7BWI, and Robert Aloysius WL7BWH. Three adults also received their licenses: Carol Helper WL7BWJ, Greg Lee WL7BWK, and Cameron Cambell WL7BWU.

Bethel, a community of 4,000 people located in western Alaska, is accessible only by boat or airplane. At a time of great cultural change amid a severe winter climate, amateur radio activity enriches and helps stabilize the community.

The Anchorage Amateur Radio Club, and Roger Hansen KL7HFQ in particular, have helped keep the kids on the air with donations of radio equipment.

Photo D. Kilbuck School hams display their call letters with their teacher, Allen Wintersteen KL7IEI (far left).

73 Review *by Bill Clarke WA4BLC*

The Yaesu FT-1000 Transceiver

A hot performer loaded with features.

Yaesu USA
17210 Edwards Road
Cerritos CA 90701
(213) 404-2700
Price Class: $3400

Photo A. The FT-1000 is a lot more complex looking than it is operating. Easy to use!

You've seen the photo ads in all the magazines and now it's here—the Yaesu FT-1000 transceiver. It's big, powerful, loaded with features, and expensive. The last point is relative, as everything seems expensive these days.

Among the top features of the FT-1000 are dual frequency reception, a full coverage receiver from 100 kHz to 30 MHz, 200 watts of output power, DDS (direct digital synthesis), and six microprocessors for operational control.

First Impressions

The FT-1000 looks impressive and its weight makes it even more so. It should be placed on a very solid operating desk or table, or its 51 pounds of weight will do terrible things. A good portion of the weight comes from the very hefty built-in power supply. After all, the transmitter is capable of 200 watts output.

A quick look at the operating manual assured me that there was little to fear in operating this new rig. It looks very complex, but the microprocessors do most of the work for you. For example: push-button selection of crystal filters, tuning speed choices, bands and VFOs, and direct keyboard frequency entry.

The FT-1000 also has 99 memories that may be scanned (each storing frequency, mode, filter selection, clarifier offset, and scan status). The automatic tuner section has an additional 39 memories for storing antenna settings for later recall.

The manual is laid out very well, is concise and easy to understand, contains considerable information about available options, and includes a basic system diagram. It is not meant to be a service manual or a primer on ham radio. However, to aid the new user in understanding the FT-1000's features, the manual is designed like a workbook and gives many hands-on examples to try while you're getting familiar with the unit. Still, I suspect that anyone very new to the hobby would be somewhat overwhelmed for the first few hours of use because of the terminology and features discussed in the text.

The manual has an excellent section on dealing with interference. It explains the operation of various controls (RF gain, AGC, noise blanker) and the proper use of the IF bandwidth, shift, and notch controls. It is good reading and unclouds the mystery of why some operators are bothered by QRM/QRN more than others. This information should really be published for the general amateur community because it applies to most modern transceivers.

I should point out that the manual is not perfect. Some illustrations are numbered and referenced incorrectly.

Operating

Of course, the first band I selected to operate on was 75 meters. Frequency selection was easy—just the push of a few buttons and the FT-1000 is ready to go to work. The first thing I noticed was the very quiet receiver (this review is being written in the thunderstorm season). It is nearly Ten-Tec quiet, and that is a real compliment! If nothing else justifies the price of this transceiver, the quietness of the receiver does.

On transmit I noticed the higher than normal output power. My peak reading meter indicated about 190 watts on LSB. A quick check-in with the gang indicated all was working, so I asked for critical reports. Nothing negative to report. In other words—it worked!

I then took my antenna tuner out of line and let the FT-1000's built-in tuner do the work. In seconds it had adjusted itself to my antenna, which is a full-sized horizontal loop cut for 75 meters. This is a nice feature, unless you are running an amplifier. Even in the latter case, with some older amps, there might be a need for it.

I spent the next several days operating on all bands and modes (except RTTY and packet). Comments I received from other hams were interesting and varied. All indicated excellent transmit audio and none indicated any problems with my signal.

The 1000 proved very easy to operate; most of the controls rarely needed touching after the initial settings. I wish that the rig had been equipped with the optional BPF-1 so I could experience real diversity reception and dual receive on mixed bands. However, the standard version as tested was a pleasure to use.

Receiver

The biggest attraction of the FT-1000 is the very quiet receiver. In a side-by-side comparison between the FT-1000, the ICOM IC-781, the ICOM IC-765, and the Kenwood TS-950, the FT-1000 came out the winner by a long shot. It also compares favorably with the ultra-quiet Ten-Tec Corsair II, which uses a different technology for frequency control and offers sparse features (few bells & whistles).

Having two VFOs is not new to most hams. The Yaesu FT-1000, however, goes an extra step and essentially provides two receivers. This allows dual frequency reception. Although not a new concept (Hallicrafters had it over twenty years ago), the Yaesu treatment is super. Unless the BPF-1 is installed , the two VFOs share the same antenna and bandpass filter. Without the optional BPF-1 you must operate both receivers on the same band, certainly a limitation if you are guarding a frequency on another band.

When receiving two frequencies at the same time, you can select a mix of the receive signals or a stereo effect, the latter with one frequency being heard in one ear and another in the other ear (assuming you are using stereo headphones). In either case you have control over the balance of the two signals.

By setting both VFOs on the same frequency, and then tuning one slightly, you will find the stereo reception quite useful for playing in the dirt, looking for weak signals, and for separating a desired signal from the trash. To aid in this quest you can se-

Photo B. Inside, the FT-1000 is stuffed with PCBs using surface-mount technology. Notice the large power transformer on the left.

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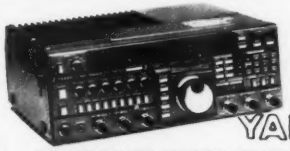

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Specifications*

(From the *FT-1000 Operating Manual*)

General

Receiving frequency range: 100 kHz–30 MHz

Transmitting frequency ranges:

160 meters: 1.5–2.0 MHz
80 meters: 3.5–4.0 MHz
40 meters: 7.0–7.5 MHz
30 meters: 10.0–10.5 MHz
20 meters: 14.0–14.5 MHz
17 meters: 18.0–18.5 MHz
15 meters: 21.0–21.5 MHz
12 meters: 24.5–25.0 MHz
10 meters: 28.0–29.7 MHz

Frequency accuracy: < ±0.5 ppm at room temperature

Frequency stability: < ±2 ppm from 0 to +50° C
(except FM: < ±200 Hz)
(w/TCXO-1 option: < ±0.5 ppm from −10° to +60° C)
(except FM: < ±150 Hz from 0° to +50° C)

Emission modes: LSB/USB (J3E), CW (A1A), FSM (J1D,J2D), AM (A3E), FM (F3E)

Basic frequency steps:
10 Hz for J3E, A1A and J1D
100 Hz for A3E, F3E and J2D

Antenna impedance: 16.5–150Ω (50Ω nominal)

Supply voltage: 100, 110, 117, 200, 220, or 234 VAC 50/60 Hz

Power consumption (approx.): 94 VA receive, 1050 VA for 200 watts transmit

Dimension (WHD): 420 x 150 x 375 mm

Weight (approx.): 25.5 kg (51 lbs.)

Transmitter

Power output: Adjustable up to 200 watts (50 watts AM carrier)

Duty cycle: 100% at 100 watts
50% at 200 watts (FM & RTTY, 3-minute tx)

Modulation types
SSB: Balanced, filtered carrier
AM: Low-level (early stage)
FM: Variable reactance
FSK: Audio frequency shift keying

Maximum FM deviation: ±2.5 kHz

FSK shift frequencies: 170, 425, and 850 Hz

Packet shift frequencies: 200, 1000 Hz

Harmonic radiation: at least 50 dB below peak output

SSB carrier suppression: at least 40 dB below peak output

Undesired sideband suppression: at least 50 dB below peak output

Audio response (SSB): not more than −6 dB from 400 to 2600 Hz

3rd-order IMD: −36 dB at 150 watts PEP (−31 dB at 200 watts PEP, or better)

Microphone impedance: 500Ω to 600Ω

Receiver

Circuit type: quadruple conversion superheterodyne (triple conversion for FM)

Intermediate frequencies: 73.62 & 8.215 MHz and 455 & 100 kHz

Sensitivity: (w/preamp on, for 10 dB S/N, 0 dB micro = 1 micro volt)

	100–250 kHz	250–500 kHz	0.5–1.8 MHz	1.8-30 MHz
SSB,CW (2.4 kHz)	<1.25 µV	<1 µV	<2 µV	<0.25 µV
AM (6 kHz)	<10 µV	<8 µV	<16 µV	<1 µV
FM (29 MHz) 12 dB SINAD				<0.5 µV

Selectivity (−6/−60 dB):

Filter	Modes	Min −6 dB BW	Max −60 dB BW
2.4 kHz	all except FM	2.2 kHz	3.8 kHz
2.0 kHz	all except AM, FM	1.8 kHz	3.6 kHz
500 Hz	CW, RTTY, Packet	500 Hz	1.2 kHz
250 Hz	CW, RTTY	240 Hz	700 Hz
	AM (wide)	6 kHz	14 kHz

Dynamic Range (typical): 108 dB (at 50 kHz, 500 Hz BW, RF amp off)

Squelch sensitivity: 1.8–30 MHz (CW, SSB, AM): <2.0 µV
28–30 MHz (FM): <0.32 µV

IF rejection (1.8–30 MHz): 80 dB or better

Image rejection (1.8–30 MHz): 80 dB or better

Maximum audio power output: 2 watts into 4Ω with <10% THD

Audio output impedance: 4OΩ to 8Ω

*Specifications are subject to change, in the interest of technical improvement, without notice or obligation.

lect different filtering for each receiver (VFO), thus allowing a slightly different form of the signal on each receiver. Experiencing this on stereo headsets will make a believer out of you.

Of great interest to SWLs (shortwave listeners) is the capability of AM diversity reception. This is accomplished by placing one receiver in USB and the other in LSB, then tuning the same AM signal.

Antenna diversity reception can only be accomplished with the BPF-1 option installed. It allows the use of a separate antenna for each receiver. This aids in reducing multipath distortion of received signals, particularly when using two different types of antennas (i.e. vertical/horizontal).

What I Liked

1. The digital display is excellent and can be dimmed at the push of a button.
2. The frequency readout can be set up to display the 10 Hz digit (which I did).
3. Adjustable front feet, no pull down bail, to set the height and angle of the front panel.
4. The meter is large, well-lighted, and easily read.
5. Selectable attenuation is in S-unit steps (6 dB each).
6. The receiver's RF amp can be switched on/off.
7. Capability to monitor outgoing signal in SSB.
8. Two VFO knobs, one for each VFO.
9. Squelch operable in all modes.
10. Fast-tune button on the hand mike for up/down tuning.
11. Complete control over the internal keyer for weight and tone. You can even simulate a "bug" (semi-automatic key).
12. Selectable (by DIP switch) packet tone pairs and RTTY frequency shift.

What I Didn't Like

1. The tuning knob, although using increments of 10 Hz, seems too fast for me. I prefer a really slow turns/frequency ratio.
2. The noise blanker caused some distortion when strong signals were present on a close frequency.
3. I noticed a distinct dead spot in the receiver at 3.932.1 MHz (and a few other frequencies). I once noted a similar problem on the Kenwood TS-140 (at other frequencies). It creates no real problem, yet it is disconcerting when tuning across a band and hearing a momentary dead spot. I discussed this with Chip Margelli of Yaesu and he confirmed the existence of the unusual problem.
4. When entering a frequency via the keypad you must remember to insert a zero before the actual frequency for those below 10 MHz.
5. Having 99 memories is not to my personal liking. I cannot remember what is stored in each and prefer to use either the keypad or VFO for frequency control. I can see where they would be nice, however, for specialized uses such as RTTY or packet.
6. The cooling system only provides continuous duty at 50% power on RTTY. Full power output is limited to three minutes duration.

The Insides of the Rig

The FT-1000 is a new and different breed of transceiver. Yaesu, drawing upon its successes in the past with modular construction, has made this newest rig with a modular design, using many surface mount components. I see very little inside the transceiver that can be considered user-serviceable, but the modular design will probably make service easier for the technician and, therefore, less expensive for the owner.

The cooling system is novel, as it uses an internal squirrel cage fan instead of the usual computer-type bladed fan. It is very quiet!

Optional Features

The FT-1000 has a number of options available. The BPF-1 Band Pass Filter, TCXO-1 High Stability Master Reference Oscillator, and optional IF Crystal Filters are the most popular.

The BPF-1 allows the subreceiver to be tuned to any frequency, using a separate antenna. It has 11 receiver bandpass filters and a switchable attenuation network.

The TCXO-1 provides improved frequency stability (see the specifications list).

A maximum of five crystal filters may be installed in the 455 kHz 3rd IFs. They cascade with the eight factory-installed filters and are

"If nothing else justifies the price of this transceiver, the quietness of the receiver does."

available in 2.4 kHz, 2.0 kHz, 500 Hz, and 250 Hz for the main receiver and 600 Hz for the subreceiver.

Other options include the CAT (RS232C level converter) and the DVS-2 Digital Voice System for recording received signals for instant replay or for canning outgoing messages, such as CQs.

Overall Marks

I have to rate the FT-1000 as a very fine piece of equipment and give the receiver extremely high marks for quiet operation. Additionally, having the dual frequency receive capabilities, rather than only two VFOs, aids immensely in reception capabilities.

As mentioned earlier, when comparing its receiver to those found in current equipment of like monetary value from other manufacturers, the FT-1000 beats all.

Is it worth the list price of $3399 (FT-1000D with all options lists at $4399)? I have to, when comparing it to other rigs on the market, say yes. I hope some of the new technology used on the FT-1000 will soon be applied to the lower-priced rigs, thereby becoming available to many more hams.

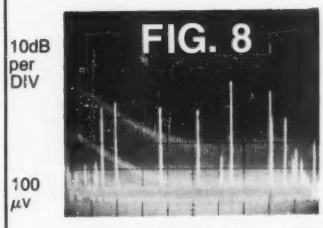
Thanks to those fine folks at EEB, 323 Mill Street NE, Vienna VA 22180 for the loan of an FT-1000 for this review. 73

finding
DIGITAL
waveform
PROBLEMS

The frequency domain approach can often show problems clearly, which only close examination in the time domain with exotic equipment will reveal.

time

For example, a circuit used for digital scope evaluation appears to produce the square wave of a 4-bit counter. The signal has a fast risetime (around 1 ns.) and some overshoot like that found in any digital system. This viewed on an analog 100 MHz scope is shown in fig. 7. Looks conventional, doesn't it?



frequency 100MHz

The same signal is then applied to the Spectrum Probe™. (20 dB atten. added to keep RF components within the logarithmic range.) Two major problems are visible in fig. 8. Why are very high spectral line levels present which are approximately 15 MHz. apart? The other problem, which can't be shown easily in the photo, is the alternating amplitude of the spectral line components — which indicates that significant low frequency components are present in the signal.

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The SPC Transmatch

Improved performance for 20 through 10 meters.

by L. B. Cebik W4RNL

With the abundance of reasonably priced commercial transmatches and an equally large number of articles on inexpensive home-brew units, there seems little that anyone could add to antenna tuner ideas. Little, that is, unless you use an all-band wire antenna. Then the limitations of commercial and general ham designs begin to show up. On 10 meters, one of the capacitors runs out of minimum capacitance a shade before the SWR drops to 1:1. The coil matches only as it hits the stop. Converting the 10:1 SWR to 50 ohms for the transmitter seems to exceed the unit's abilities, even though it performs well on every other band.

If you only wish to flatten a 2:1 or 3:1 SWR, you may never encounter these problems on any band. However, center-fed Zepp and variations on the G5RV antennas can present the transmatch with complex combinations of resistance and reactance. With enough reactance at the transmatch, normal all-band components and construction may provide a poor match at 10, 12 and 15 meters.

The problem is with the all-band design concept. My commercial transmatch covers 160 to 10 meters, with a 36 µH inductor and a pair of 240 pF air variables in a standard T circuit. This is all enclosed in a case allowing a half-inch space between the components and the chassis or case metal. Although the tuner is compact and versatile, the high-value components have high minimum values as well. The capacitors are rated at 40 pF minimum, which looks more like 45 or 50 pF with the case closed. Minimum inductance is not listed for the rotary inductor, but between 1 and 2 µH would be a good guess, especially with its 2½-inch external lead to ground.

Transmatch Performance

The standard T circuit (with series capacitors and a shunt coil) is a high-pass filter. It does little to suppress harmonic energy. The SPC circuit (as W1FB calls it), shown for comparison with the T in Figure 1, is claimed to provide an estimated 20 dB of harmonic suppression. Of course, we will only achieve the rated selectivity if we can maintain a high-loaded circuit Q. Normally, stray capacitance and inductance are low Q. Some designs use an additional fixed coil just for 10 meters, sacrificing variability for higher Q. In my commercial tuner, on 10 meters, most of the circuit capacitance and inductance come from stray sources in the wiring or the component construction. Just converting its design to the SPC circuit would not achieve much, but the conversion would lengthen the 14-inch long unit by another 10 inches by replacing the single-section capacitor with a split-stator version.

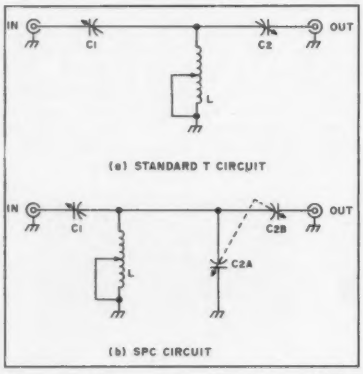

Figure 1. Comparison of T (1 a) and SPC (1 b) transmatch circuits.

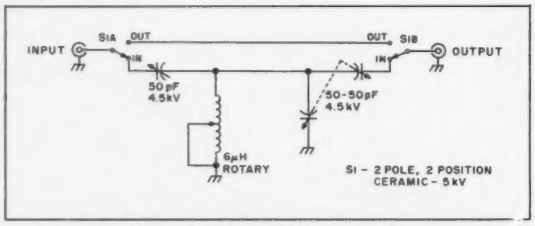

Figure 2. Schematic for the 20–10 meter SPC transmatch.

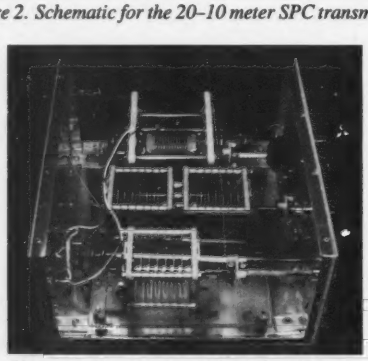

Photo A. Interior view of the 20–10 meter SPC transmatch.

Nonetheless, I consider my commercial unit a good tuner of its kind. To solve the problem of achieving high Q, high capability 10 meter matching, we may have to give up the idea of an all-band design. A 20-through-10 meter design to cover the "upper" HF bands offers a much better chance for nearly optimal performance. However, we can achieve that performance only if we remember all the hints various writers have given about component selection, layout, and materials. Since so many commercial and ham designs seem to have forgotten some of these tips, perhaps I should offer a few words about transmatches, even if only to jog the memory.

Component Values and Construction

The first step to achieving better 10-meter performance while not losing all versatility in the transmatch was to scale down components for assured coverage from 20 through 10 meters. 50 pF capacitors with a 5 µH coil would provide more than enough range for 20 meters. They would also maximize chances for low enough minimum values to perform well on 10. The SPC circuit requires one single-section capacitor, one split-stator capacitor, and a rotary inductor for infinite tuning choices.

Among the best transmatch capacitors on the new and surplus market are a series of Johnson (now produced by Cardwell) 4.5k volt units. For high-power use, I prefer these units with 0.125-inch plate spacing to units with 0.075-inch or 2-mm spacing. The

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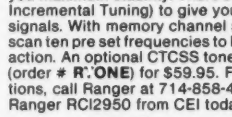

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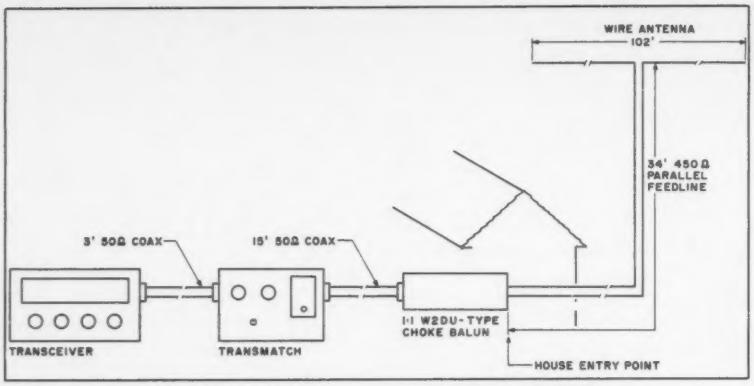

Figure 3. All-band wire antenna system used at W4RNL.

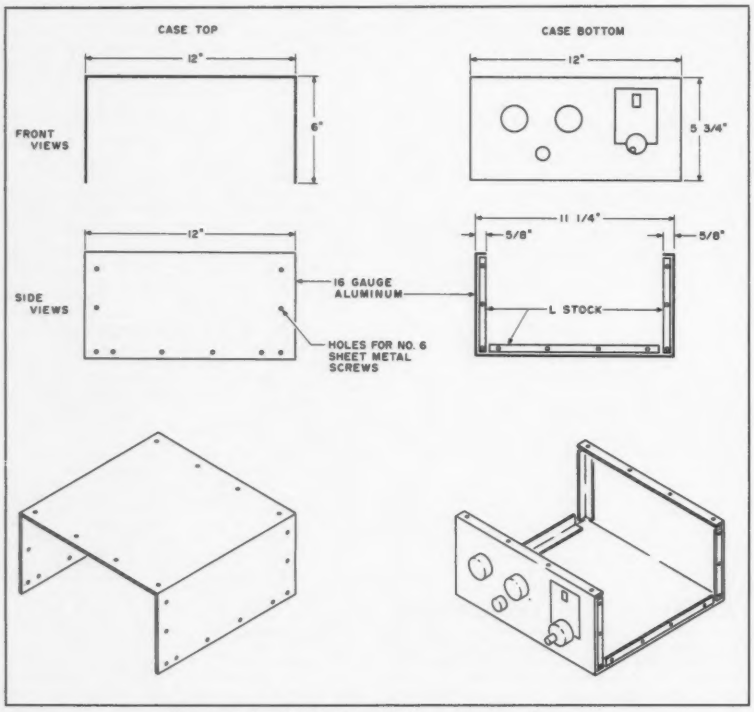

Figure 4. Simple 2-piece aluminum transmatch case.

present 154-12 unit is equivalent to the 1950s 50E45, while the 154-508 split-stator model is the old 50ED45. Both units have 52 to 53 pF as their maximum values and 10 to 11 pF as minimum values. Capacitance meter measurements confirmed the figures. New units cost above $35 and $60, respectively, but you may be able to find good quality units of either model at hamfests.

What gives these units their low minimum values is the use of trapezoid end plates presenting the least capacitance to stator plates. Until RF-rated acrylic end-plate units become generally available in a variety of values, the Johnson-Cardwell units are among the best high-power units around. A British firm (Nevada Communications) has introduced 250 pF, 2-mm plate spacing units that have minimum values of 13 pF per section. Millen 16000-series (e.g., the 16550 and 16100) capacitors (now distributed by Caywood) are also promising if you must purchase new units. These 6 kV, 0.171-inch air gap units will handle any amateur power. They cost slightly more than new Johnsons. Their minimum values are barely higher than the Johnson units. (At hamfests, be careful with old battleship capacitors, i.e. units heavily framed in metal. One of my 35 pF maximum units only goes down to 17 pF minimum. It may be useful for something, but not for this transmatch.)

For the rotary inductor, I had to settle for something a bit larger than 5 µH. The same Knoxville hamfest that provided the two needed capacitors (through the sharp eyes of my friend, KA4SAL, who got them for only $5 each) also produced an old military antenna tuner coil. It probably came from a TN-339 military tuner, which is similar to the BC-939. Fair Radio Sales has recently listed the 339 at $125 used and the coil at about $16. Measurements on the inductor with a grid dip meter yielded about 0.6 to 6.5 µH from one end to the other.

The inductor appears to be like the current B & W 3851, which lists new in the $80 range. Ceramics may have improved since WWII. The physical size of the end plates and

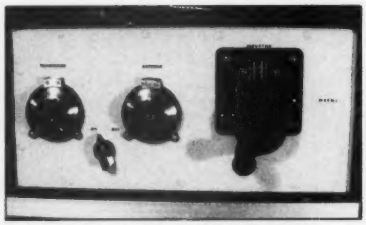

Photo B. Panel view of the transmatch at the W4RNL operating position.

braces is greater than planned, with outside dimensions of about 3" x 5" x 6". However, the range of the roughly 2" diameter, 2" long, 12-turn rotary inductor inside the frame is just about right. The #12 tinned copper wire is sized for high power.

The use of ceramic rather than metal end plates helps to reduce stray capacitance between coil turns and ground. In fact, none of the metal bars between end plates will be grounded. Every source of stray capacitance will be minimized. As with capacitors, RF-rated acrylic-supported rotary inductors are beginning to appear. Again, Nevada has introduced a 30 µH coil with a minimum inductance of about 1 µH. Properly designed, only these types of units will surpass the ceramic unit in minimum inductance value and in potential circuit strays. For the $5 price, the surplus ceramic inductor is quite adequate.

Transmatch Construction

To minimize stray inductance and capacitance, the transmatch uses the simplest possible design. (See Figure 2.) It contains no SWR circuit, since there is already one in the line. The one concession to convenience is an "in-out" switch, a ceramic unit capable of handling fairly high power. Having a ham dad (W1BUK) with a good junk box helped here.

The circuit also contains no balun transformer. My particular antenna system makes one unnecessary, as Figure 3 demonstrates. The 102-foot antenna uses 34 feet of 450 ohm parallel feeder to reach the side of the house. However, that is about 15 feet from the equipment. Using a home-brew version of the W2DU choke-style balun (not a transformer), I convert directly to coaxial cable at the house entry. Radio Works sells a choke balun of similar design. My calculations suggest that, at the highest SWR levels, I can lose no more than 1 dB of pow-

Parts List

1	50-50 pF dual section, 4.5 kV air variable capacitor (Johnson 154-508 or equivalent)
1	50 pF, 4.5 kV air variable capacitor (Johnson 154-12 or equivalent)
1	5 to 6 µH rotary inductor (B&W 3851 or equivalent)
1	2-pole, 2-position, 5 kV ceramic rotary switch
1	Turns counting dial for inductor (B&W 3902 "Cyclometer" or equivalent)
2	6:1 vernier dials for capacitors
3	Insulated flexible couplings for capacitors and inductor
4	Insulated shaft extensions for capacitors, inductor, and switch
1	Through-panel shaft for switch
1	Switch knob
2	SO-238 panel mounted coax receptacles
1	11″ x 12″ x 5¾″ case or materials for case
	Miscellaneous paint, lettering, hardware

Suppliers of Transmatch Parts

Barker and Williamson, 10 Canal Street, Bristol PA 19007 (Inductors, turns counters.)

Caywood Electronics, Inc., P.O. Drawer U, Malden MA 02148-0921 (Millen capacitors and other components.)

Fair Radio Sales, P.O. Box 1105, 1016 E. Euraka Street, Lima OH 45802 (Surplus parts and equipment.)

Kilo-Tec, Box 1001, Oak View CA 93022 (Nevada acrylic-supported variable capacitors and inductors, B & W components, and antenna supplies.)

Nevada Communications, Telecomms, 189 London Road, North End, Portsmouth, Hants., PO2 9AE, United Kingdom (Acrylic-supported variable capacitors and inductors.)

Radiokit, P.O. Box 973, Pelham NH 03076 (Variable capacitors, inductors, dials, turns counters, insulators, switches, etc.)

Radio Works, Box 6159, Portsmouth VA 23703 (Baluns, antennas, feedline.)

er at 10 meters. However, I gain freedom from all the unbalancing effects of metal conduit and other house fixtures. Hence, I do not radiate indoors. The system works well for me, however controversial the ideas behind it.

The photograph shows the essential elements of transmatch construction. The capacitors and the inductor mount on an acrylic plate. Within the limits of component size, wiring is as short and direct as possible. The front-panel end of the inductor, the same end of the coil-contact bar, and the grounded stator section connect together with short leads of #14 silver-plated Teflon™-insulated wire from an old project. The ground terminal is actually a threaded metal spacer the same length as the base plate corner supports (one inch). The rear inductor contact bar terminal also goes to a spacer. The cabinet provides the ground points. Use a lock washer with the machine screws to ensure good screw-to-case contacts.

Everything, including the switch, mounts on the base plate. Scrap acrylic provides blocks for the capacitors and a mounting plate for the switch. Ultimately, only the four corner-mounting bolts and the two ground spacer-lugs will make contact with the cabinet.

The acrylic base plate is about 11″ x 7″. Insulated shaft couplings and shaft extensions, plus the switch at the rear of the plate, enlarge the space requirements. Therefore, the unit requires a cabinet about 12″ wide, 5¾″ high, and 11¼″ inches front-to-back. Figure 4 shows an idealized cabinet made from two 12″ x 24″ pieces of 16-gauge aluminum. The result is a shadow cabinet with a wide front lip and a quarter-inch side overlap.

More important than appearance is the fact that the cabinet provides at least one inch or more of clearance in every direction from the transmatch components. As noted, my commercial unit uses only about a half-inch of clearance, but requires extensive readjustment on the upper HF bands between open and closed cabinet use. Additional clearance makes the home-brew panel larger than the commercial one, but that is not much of a price to pay for lower strays.

Since I did not have access to the ideal 16-gauge aluminum, I used thinner utility aluminum from a home improvement center. Again, the photograph of the interior shows the additional material used to strengthen the sheet stock. L-stock, ½″ x ½″ x 1/16″ thick, forms a ring around the front and rear panels, which have an extra 5¾″ x 12″ sheet to strengthen the panels. The bottom of the cabinet has 1″ wide by 1/16″ thick strips running from front to back. They carry the cabinet feet and the corner-mounting bolts from the base plate. Four short strips of ⅛″ thick strap lock the feet and longer strap to the L-stock at the front panel. More L-stock along the sides of the cabinet bottom provides a place for sheet-metal screws to hold the top.

The front panel capacitor knobs are Japanese verniers available from several sources. (Verniers are necessary with the sharp tuning of the SPC design.) The inductor turns counter costs nearly $60 new or about $25 at some hamfests. To save me money, W1BUK came to the rescue again. Dismantling an old beat-up counter from his junk box allowed me to clean the counter face and the hardware, paint the bezel, clean and grease the gears, and replace the metal shaft with a plastic one. A large combination crank-knob finished the rejuvenation. The switch required only a panel through-shaft and an insulated extension to the switch shaft itself.

The rear panel has only two coax receptacles. Each is mounted to provide a short lead to the switch. After fitting and drilling and trial mounting all components, disassemble everything for painting. Several thin coats of spray paint, a little rub-on lettering, and several thin coats of clear acrylic complete the job. Before painting, place small pieces of tape over the two bottom holes for the screws that connect the base-plate ground point spacers to the case. The unpainted aluminum will provide a surer ground contact.

The Results

The results were everything I had hoped for. A serious test engineer would caution that, without extensive laboratory tests, we cannot specify precisely the effect of each effort to improve performance. However, the combination works. Striving for the lowest component minimum values, reducing wiring strays, and reducing cabinet strays produces a transmatch that has spare capability at 10 meters.

Although we cannot directly compare an SPC design with a standard T design, the new unit has more than a half-turn of coil and 15 percent of capacitor left in the "worst" case at the top of 10 meters. Settings for other bands fall into just about predictable positions. The amount of required readjustment between lid-on and lid-off operation is insignificant. The band-pass characteristic of the design shows up in the ability to make initial settings by listening to receiver noise. Only minor peaking is necessary to null the SWR. All settings are repeatable. In short, the transmatch does everything I asked of it.

And a bit more. As an added bonus, the unit matches my wire antenna on both 30 and 40 meters, as well as on the higher bands. Because the SPC design provides greater harmonic reduction than the standard T design, the commercial unit is now labeled for 80 and 160 meters only.

The lesson is that "all-band" is not always best. Designing a transmatch with 10 meters in mind, and sacrificing the lowest bands, resulted in superior performance where I needed it. Even new, the capacitors and coil would cost less than the 240 pF and 36 µH units used in low-band tuners. Of course, only luck, family, and friends kept the total cost of this project well under $50. But with a little patience, you can be that lucky, too. 73

You may contact L. B. Cebik W4RNL at 2414 Fair Dr., Knoxville TN 37918.

73 Review

by Jim Gray W1XU

Antennas West
Box 50062-S
Provo UT 84605
Tel. (800) 926-7373
Price Class: $30

Antenna Quick-Launch System

All you need is a strong arm and the QL system.

Photo. Nuge WB8GLQ launches the support line for a new 75 meter dipole into a nearby tree. Note, however, that the proper technique requires placing the bucket on the ground in front of you and throwing the weight underhanded.

Round, Yellow, and Fuzzy . . . ?

OK guys and gals, time for a quiz: What's spherical, the size of a tennis ball, bright yellow, fuzzy all over, and weighs a pound? Give up? I don't blame you, as I wouldn't have guessed it either—not until I saw it, and maybe not even then. When you see it, you still can't imagine what it's for!

The answer is the QL Quick-Launch system from Antennas West. Jim Stevens, proprietor of Antennas West, has been a wire antenna enthusiast for more years than many hams have been alive, and he's tried them all. Early in the game, he decided that one clue to a good antenna was height, but the first trick was getting tall supports, and the second trick was placing the antenna near the top of the supports.

Wire Antenna Erection Methods

We've all tried the bow-and-arrow method, haven't we? And the slingshot system, the strong-arm technique (ouch!), and even the old line-around-the-pliers ploy (my favorite). Each has its advantages and disadvantages, mostly the latter. "So what's the point?" you ask. Simply this: After about five years of experimenting with materials and techniques, Jim Stevens has come up with what I consider to be THE solution to wire antenna erection tasks. He has designed a system for putting up your wire antenna at a useful height, especially if you have tall trees for support.

Contents of the System

The system is simple, inexpensive, and (almost) foolproof. It consists of the projectile, the leader line, the support line, and the bucket.

The projectile is a one-third pound spherical weight about the size of a golf ball with a fishing swivel attachment embedded in it. It's a bright red-orange fluorescent color for easy visibility even in poor light. A yellow fluorescent tennis ball with a slit in its surface admits the projectile. The twist-proof, neat length of nylon leader line, especially woven to prevent snarling and snagging, is also a fluorescent yellow—all 150 feet or so of it. Finally, 200 feet of camouflage Dacron™ invisible to the causal passerby. Prefabricated to last as long as you'll need it, it's also strong and tangle-proof. Dacron is also darned near stretch-proof, too. The last component of the QL system, the bucket, is about the size of a gallon paint can with tapering sides, squeeze-on lid, and bail, or handle. Everything I've mentioned so far fits inside the bucket, except for the antenna and the tall supporting trees. And there's room for extra line and projectiles.

To Use, Borrow an Arm

How do you use this contraption? Thought you'd never ask. Let's say you've picked your supporting objects, and now you're looking at the tennis ball and weight . . . and line. Unless you're clearly out of the way of houses, people, animals, and other impediments, maybe you'd better leave the projectile-weight inside its protective tennis ball cover, otherwise significant damage might result to innocent bystanders. On the other hand, if you're alone and out in the clear, leave the cover off the weight. The golf-ball sized weight does a really neat job of dropping down through branches and twigs and leaves without the cover.

Today I wanted to put up my new loop antenna for 30 meters and support it between two 45-foot Ponderosa pines in the side lot. I set up the paraphernalia in the yard, in the clear, and the recommended distance away from the trunk of the tree. Jim Stevens has this all figured out for you, and in his instruction manual, he describes in detail the best technique for using his system.

The idea is to throw the weighed leader-line over the supports, preferably one at a time, unless you are Tarzan. The throwing arm of a man in his late 50s and early 60s is not the equivalent of the arm of even a small teenage boy, and certainly not comparable to the arm of a young athlete. My son, a vigorous thirty years of age, happened to be home, and he "volunteered" for the job of projectile launcher. I was the "launch meister." On the first try, he put the weight, line, and bucket (tied to the line for safety) over the blooming tree! The next time, the apparatus sailed over the exact top of the tree, dead center. The weight dropped neatly through the branches, carrying the bright yellow line with it. Voila! Perfect performance.

Thus, in a matter of less than fifteen minutes, the job was accomplished. No strain, no pain, and exactly where I wanted it. I pulled up the heavier support line with plenty of spare, but I hated to cut that beautiful stuff so I coiled the unused part neatly and hung it from the tree trunk.

Simple and Elegant

To sum up, you tie one end of the leader-line to the bucket's bail (or handle), gently drop the line into the bucket, allowing it to settle (beware: do not try to coil it) loop upon loop, until it's all in the bucket, leaving the projectile outside. Then you place the bucket on the ground in front of you, making sure there are no bushes or entanglements to trap the line when you throw the weight.

The line comes flying out of the bucket as neatly as you please, with nary a snarl or backlash. Jim Stevens tried a lot of line materials and sizes before he got one that wouldn't loop, snag, or snarl itself. Remember the old harpooner whose leg was caught in the line and he was dragged under by a whale? Keep that line in the bucket until you're ready to throw it, and keep all possible snags clear of it when you set it up.

The Quick-Launch antenna-raising system really works! How well, you'll have to try it for yourself to believe it. No more bow-and-arrow, agile Nimrod, or freckle-faced slingshot artist to tell on you—just the Antennas West QL system, and one more thing: a good throwing arm!

The basic kit sells for $30 and includes reusable (if you don't lose them) fluorescent projectiles, "twilight-view" launch line, safety cover (tennis ball), a 200-foot spool of double Dacron twist-proof support line, the bucket, and a detailed instruction manual. There is a 51-foot system for 80–10 meters and a 102-foot system for 160–10 meters.

Should you need them, Jim will sell you extra line, weights, and probably even tennis balls for a small price. But frankly, the original stuff ought to last several seasons, and I doubt you'd need replacements, unless you forget to carefully store the system when finished, and some needy soul comes by and makes off with your treasure. I keep mine under lock and key, just in case!

Jim Gray W1XU, 210 Chateau Circle, Payson, Arizona 85541, has been 73's propagation columnist since 1984. He's been a ham for 40 years, and likes to operate CW on WARC bands 12, 17, and 30. He's also interested in aviation and photography.

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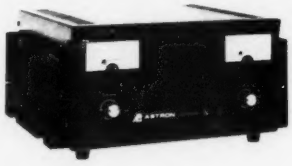

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SPECIAL FEATURES

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- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
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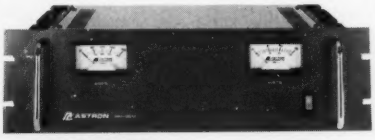
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅞ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7

RM SERIES



MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

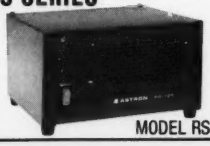
VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES



MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

ROBO-COPY

Automate your shack with a CW copier.

by Michael Hansen WB9DYI

As an avid CW operator, I have often heard 50+ wpm (words per minute) QSOs and wanted a low-cost way to see what automated CW was about. Many of the Morse code receive programs on the market don't work on DOS PCs, and I wanted a fully featured software package that runs on an IBM or clone.

This inspired me to write a program I call ROBO-COPY. It's an easy-to-use program which, with the addition of a simple interface circuit, allows you to use your IBM or compatible to copy CW right from the speaker or low impedance headphone outputs of your rig. The software was designed to run on anything from a bare bones PC up. The minimum requirements are at least 256K memory, CGA video adapter, and a floppy drive. The hardware interface to the PC is through the COM1 port.

I designed this program to be flexible because every CW operator has a different style. With a few single keystrokes, you can change copy parameters to match virtually any op's unique character and word timing. Another feature resets these timings to nominal values, again with a single keystroke. Critical mark and space timing parameters are adjusted automatically by a statistical algorithm that copies any speed CW up to 120 words per minute.

Care has been taken in the design of this software to ensure compatibility with a broad spectrum of DOS machines, both IBM and clones. All manipulations of the hardware are done via the standard BIOS calls. The COM port's baud rate clock measures incoming signals, so you don't need CPU clock speed dependent timing loops on machines that don't have an on-board real-time clock with millisecond resolution (e.g., PC class machines).

To reduce the effects of noise, a sampling filter has been built into the software. This filter "qualifies" a transition from a mark (dit or dah) to a space (no signal) or vice versa "by over sampling" the transition. In order for a transition to be recognized by the filter, the signal must be free of any glitches for a period of 16 (LOW setting), 32 (MED setting) or 64 (HI setting) continuous samples. Like the timing settings, you can change the filter parameter with a single keystroke. With a good quality receiver (I use a Kenwood TS-520) and a little practice, you can copy signals as weak as S4 or S5 with good readability.

All of the Morse English characters listed in the ARRL Handbook are supported. This character set includes *A-Z 0-9/ = (),:$- " ',.* . The command character set is also complete per the handbook: *SK, SN, AL, AS, AR, BT, HH, IQ* and *KA*. These two-letter commands are displayed in reverse video for easy recognition.

In addition to the above set of characters, two characters are used that are not part of the ARRL standard Morse set. These two characters annotate internal errors. An * means that an undefined code was received. For example, ---- (four dahs). A # means that a character "overran" the maximum length for a single Morse character; that is, a character with more than eight marks (dits or dahs).

Three Special Features

A handy feature for retaining important QSO data, such as callsigns, names, and signal reports, is the scratch pad, located in the bottom four lines of the screen. You can turn the scratch pad on and off by pressing the space bar to capture data. When the scratch pad is on, the data received will be displayed in both the copy and scratch pad area. When the scratch pad is turned off, the incoming CW will only be displayed in the copy area and a | will denote where the scratch pad copy was terminated.

Like all user-friendly software, HELP is available online. Simply press the letter *H* to access these screens and they will display information on setting, clearing, and restoring copy parameters. You can also find tips on receiver operation in the HELP section.

The Mode command turns ROBO-COPY into a CW Elmer. When you select Normal Mode, the incoming character is displayed immediately after it is received. The Teach Mode delays the last character received until immediately before the next character. At speeds of 3–10 wpm, this feature prompts the student to hear, think, and then see the incoming character. Since you can connect the interface to any speaker or low-impedance audio output, you can practice in the Teach Mode with a receiver and on-the-air signal, like W1AW, or with a tape from a tape player.

Audio Interface

The interface circuit couldn't be much simpler (see Figure 1). T1 is a small, common power transformer which isolates the computer from the transceiver. I used a power transformer instead of an audio transformer because power transformers offer higher isolation voltage capabilities. Most power transformers can withstand a 2,000 volt difference between the primary and secondary windings. The typical transistor audio transformer, while exhibiting a much greater frequency range, can only withstand about 250 volts. This margin of safety could save your equipment and disk data (maybe even your life) by keeping RF, static discharges and ground faults from entering your PC or rig via the interface.

Besides isolating the two systems, T1 steps up the speaker or headphone output voltage from a nominal 0.3V p-p across an 8 ohm load to about 3V into the base of the PNP Darlington transistor pair. The 12V secondary of T1 looks like about a 300 ohm load to your speaker or low-impedance headphone output. This allows you to keep the interface in parallel with your audio output and monitor the signal through your speaker. You could also drive a small monitor speaker included in the interface circuit, as shown in Figure 1.

The Darlington configuration is not used so much for its high current gain as for its 1.4V Vbe clipping action that eliminates low-level background noise. When the input signal to the transistor is less than this threshold, no current is drawn by the transistors; once the threshold is exceeded, the transistors use their combined high current gain to amplify and rectify the incoming audio. The time constants of the 470 ohm resistor and 4.7 µF capacitor are used to filter the rectified audio supplied through the indicator LED from the collectors of the Darlington pair.

The resulting rectified and filtered audio is fed directly into the RI (Ring Indicator) pin of the PC's COM1 port. The signal supplied by the interface isn't the sharp-edged digital signal you might expect a computer to require. Rather, the signal at the RI pin has artifacts of the audio signal from which it is derived. The RS-232 receiver inside the COM1 port has excellent switching characteristics and does a good job of cleaning up the signal for the PC.

In order to prevent RFI from the PC from entering your receiver via the interface, capacitors C4 and C5 should be installed right in the female COM port connector. Make sure that the capacitor leads have some "spaghetti" nonconductive tubing to prevent internal shorts in the connector. You can gain additional RFI attenuation by using a large ferrite toroid core as an RF choke on the interface cable. Simply thread the cable

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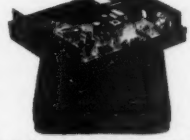
New low cost microwave doppler radar kit "clocks" cars, planes, boats, horses, bikes, baseballs, models, runners or virtually anything that moves. Operates at 2.6 GHz with over 1/4 mile range. LED digital readout displays speeds in miles per hour, kilometers per hour or feet per second! Earphone output permits listening to actual doppler shift. Uses two 1 lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build--all microwave circuitry is PC stripline. Kit includes deluxe ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

RADIOS



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Sensitive all mode, AM, CW, SSB receivers for 3.5—4.0 or 70—75 MHz. Direct conversion design using NE602 IC as featured in QST and ARRL handbooks. Less than 1 μv sensitivity, varactor diode tuned, 50 mw audio output. Runs on 9VDC, has RF gain control. This kit is very easy to build, lots of fun and educational—ideal for the beginner or the old pro. The optional matching case kit features a rugged ABS plastic case with screened graphics. Included are machined aluminum knobs for a well-finished professional look.

20 MTR receiver kit HR-2		40 MTR receiver kit HR-4		80 MTR receiver kit HR-8		Receiver case CHR	
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Operate a mini ham shack. These little CW rigs are ideal mates to our 40 and 80 meter receivers. Features include smooth variable tuning, one watt output and excellent keying characteristics. Runs on 12 VDC and is VSWR protected. See how far you can stretch your signal with one of these mini rigs. Optional ABS cases are available.

20 MTR QRP kit QRP-20		40 MTR QRP kit QRP-40		80 MTR QRP kit QRP-80		Case kit CQRP	
	$29.95		$29.95		$29.95		$12.95

AIRCRAFT RECEIVER KIT

Hear exciting aircraft communications—picks up planes up to 100 miles away. Receives 110—136 MHz AM air band, varactor tuned superhet design with AGC, ceramic filter and adjustable squelch. Runs on 9V battery, 50 mw audio output, 1 μv sensitivity. Optional matching ABS plastic case lets you take it anywhere, features screened graphics and machined aluminum knobs for a real professional look. Compact—great for airshows or for just plain hanging around the airport.

Complete kit, AR-1 **$24.95** Receiver case kit, CAR-1 **$12.95**

SHORTWAVE RECEIVER KIT

A fantastic receiver that captures the world with just a 12" antenna! Receives 4—11 MHz in 2 MHz bands, varactor tuned, superhet design with AGC, RF gain control, and 5C mw audio output. Uses new Signetics mixer chip for less than a microvolt sensitivity, runs on 9V battery. This is a fascinating scout, school or club project, and will provide hours of fun even to the most serious DX'er. Add the optional case kit and you have a real nice looking shortwave set.

Complete kit, SR-1 **$24.95** Receiver case kit, CSR-1 **$12.95**

PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software, PC board, all necessary parts and full documentation.

Complete kit, PC-1 **$49.95**

FM COMMUNICATIONS/ 2 MTR, 10 MTR & 220 RECEIVERS

Sensitive superhet FM receiver tunes any 5 MHz segment of band. Listen to ham operations, high band police calls, weather or mobile phone calls! Easy to build receiver features varactor tuning, IC mixer stage, ceramic IF filters and dual conversion design with adjustable squelch. Less than 1 μv sensitivity, runs on 9 V battery, with 50 mw audio output. Optional ABS case with screened graphics and machined aluminum knobs provide a nice professional look.

2 MTR kit FR-7		10 MTR kit FR-10		220 MHz kit FR-20		Receiver case kit CFR-7	
	$29.95		$29.95		$29.95		$12.95

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A sensitive all purpose preamp, ideal for scanners, TV sets, VHF, UHF rigs, counters, etc. Features low noise, 4 db NF, 20 db gain, 100 KHz—1 GHz operation. Runs on 9—12 VDC, 50 ohms input.

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Transmits modulated infrared light up to 30 feet without lenses, up to 1/4 mile using lenses. Uses 30 KHz carrier for hum-free operation, transmits thru windows, etc. Ideal for "bugs" or listening to IR remote controls. Transmitter has sensitive mike input, receiver uses PIN detector and drives speaker output. Units operates on 9—12 VDC.

Transmitter kit, LB-6 **$8.95**
Receiver kit, LB-5 **$9.95**

HIGH POWER FM WIRELESS MIKE

A high power unit that will transmit up to 1/2 mile to any FM broadcast radio. Sensitive input accepts any type of mike, will pick up normal voices 10 feet away using the available mini-electric mike cartridge. Operates on 9—12 VDC

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$49.95 wired includes AC adapter PR-2 kit $38.95

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The PS-2 is handy for high resolution audio resolution measurements, multiplies Up in frequency • great for PL tone measurements • multiplies by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

$69.95 wired PS-2 kit $49.95

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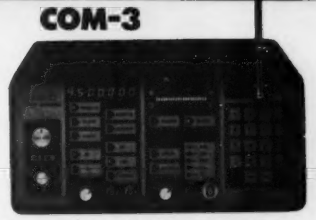
Extends the range of your present counter to 1.5 GHz • 2 stage preamp • divide by 1000 circuitry • super sensitive (50 mV typical) • BNC connectors • 1.5 GHz in, 1.5 MHz out • drives any counter.

$89.95 wired includes AC adapter

COM-3



$2795.00 THE COMMUNICATIONS SERVICE MONITOR THAT WORKS HARDER FOR LESS.

Introducing COM-3... the new service monitor designed by service technicians for service technicians. It works harder for less... giving you advanced testing capabilities at a very affordable price. FEATURES • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10,000 μv output levels • High receive sensitivity, less than 5 μv • 100 KHz to 999.9995 MHz Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder, 1 KHz and external modulation

MINI KITS—EASY TO ASSEMBLE—FUN TO USE

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Complete kit, TD-1 **$5.95**

COLOR ORGAN See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110VAC.
ML-1 Kit. **$8.95**

VOICE ACTIVATED SWITCH Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED or even a tape recorder motor. Runs on 9 VDC.
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40 WATT 2 mtr PWR AMP Simple Class C power amp features 8 times power gain 1 W in for 8 out, 2 W in for 15 out, 5 W in for 40 W out. Max output of 50 W, incredible value, complete with all parts, less case and T-R relay.
PA-1, 40 W pwr amp kit **$27.95**
TR-1, RF sensed T-R relay kit **6.95**

VIDEO MODULATOR Converts any TV to video monitor. Super stable, tunable over ch 4-6. Runs on 5-15V accepts std. video signal. Best unit on the market! Complete kit. JM-7 **$12.95**

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BL-1 Kit. **$3.95**

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MB-1 Kit **$4.95**

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UT-5 Kit **$5.95**

WHISPER LIGHT An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.
WL-1 Kit **$6.95**

FM WIRELESS MIKE Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.
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FM-2 Kit **$7.95**

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PB-1 KIT **$14.95**

FM RECEIVER For built-in applications or hobby experimentation. Full fledged superheterodyne receiver, microvolt sensitivity, 10.7 MHz IF, Integrated Circuit detector, 50 mw audio amplifier, 9V external power source, operation on standard FM broadcast band as well as large portions on each side, compact (6" square), for bug detection or reception
FR-1 KIT **$14.95**

FM MINI MIKE A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.
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FM-3 Wired and Tested **19.95**

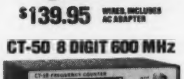
NEW

MICROWAVE INTRUSION ALARM A real microwave doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz and is not affected by heat, light or vibrations. Drives up to 100 ma output, normally open or closed, runs on 12 VDC
Complete Kit, MD-3 **$16.95**

NEW

SPEECH SCRAMBLER Communicate in total privacy over your telephone or radio. This scrambler kit features full duplex operation using frequency inversion. Runs on a 9 volt battery. Both mike and line or speaker output/inputs. Easy to connect to any radio—telephone use requires no direct connection! Easy to build, uses IC DSM circuitry. Can also be used to descramble most com. scramblers.
Complete kit, SS-7 **$29.95**
Case kit, CSS-7 **12.95**

CT-70 7 DIGIT 525 MHz



$139.95 WIRED, INCLUDES AC ADAPTER

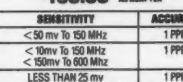
CT-90 9 DIGIT 600 MHz

$169.95 WIRED INCLUDES AC ADAPTER

CT-50 8 DIGIT 600 MHz

$189.95 WIRED INCLUDES AC ADAPTER

CT-125 9 DIGIT 1.2 GHz



$189.95 WIRED INCLUDES AC ADAPTER

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Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one year warranty on parts and labor. We take great pride in being the largest manufacturer of low cost counters in the entire USA. Compare specifications. Our counters are full featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry and durable high quality epoxy glass, plated-thru PC Board construction. All units are 100% manufactured in the USA.

MODEL	FREQ RANGE	SENSITIVITY	ACCURACY	DIGITS	RESOLUTION	PRICE
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CT-90	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	1 PPM	9	0.1Hz, 10Hz, 100 Hz	169.95
CT-50	5 Hz-600 MHz	LESS THAN 25 mv	1 PPM	8	1Hz, 10Hz	189.95
CT-125	10 Hz-1.25 GHz	< 25mv @ 50 MHz < 15mv @ 500 MHz < 100mv @ 800 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	189.95
CT-90 WITH OV-1 OPTION	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	0.1 PPM	9	0.1Hz, 1Hz, 10Hz	229.99

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Telescopic whip antenna—BNC plug	$ 8.95
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Low pass probe, audio use	19.95
Direct probe, general purpose use	13.95
Tilt bail for CT-70, 90 & 125	3.95
Nicad pack for CT-70, 90 & 125	9.95

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through the toroid as many times as possible. The toroid should be positioned as close to the PC end of the cable as practical.

Raw Speed versus Sophistication

You can automate the process of copying CW at several different levels. To gain a perspective of this task, let's look at the inventory of skills various levels of CW operators possess.

Experienced CW operators are often regular members of CW traffic nets. Able to copy more than 35 wpm for sustained periods, they copy complete words and sometimes entire phrases. They can copy signals imperceptible to the untrained ear, even through moderate QRM and QRN. Almost as important as their ability to copy the information is their ability to reconstruct what was lost in the process of communication. Because they have trained their minds to semi-consciously copy code through aural pattern recognition, their conscious minds are free to make judgments on the content of the message being received. It's this type of higher level language function that let us make sense of the following sentence: *You c n stil re d this sent nce ev n hough it s miss g lett rs.*

A cybernetic version of the CW expert is theoretically possible with today's leading edge digital signal processing and artificial intelligence technology. Considerable research is being expended on these types of systems, particularly in the area of direct voice interface to computers. As you might expect, personal computers will have to take yet another quantum leap in technology before they will have the resources to match this challenge.

Short of having a large research budget and the latest in processor hardware, we can still write a very effective CW code copier program for the PC. ROBO-COPY's practical approach mimics the method employed by beginners. Instead of recognizing patterns in the incoming CW, this method sorts the signal into dits and dahs. Information on when a character or word has been completed is derived solely from the amount of time between message elements.

For humans, using this primitive approach limits our copy speed to not much more than 5–7 wpm. Beyond that, the conscious mind is not effective in measuring and assembling finite events. While the computer is hopelessly outclassed in virtually every other comparison with the human brain, it has no biological equal when it comes to making very simple decisions very fast. This means that a computer programmed to copy CW a dit at a time is an entirely workable system. . . no problems with speed, frustration or distractions.

Using ROBO-COPY

A typical session begins with the operator logging his machine onto the drive and directory where ROBO-COPY is stored. Simply enter ROBO, then press ENTER or RETURN. A few seconds later the main screen should be displayed. Check to make sure that the interface is turned on and is connected to COM1.

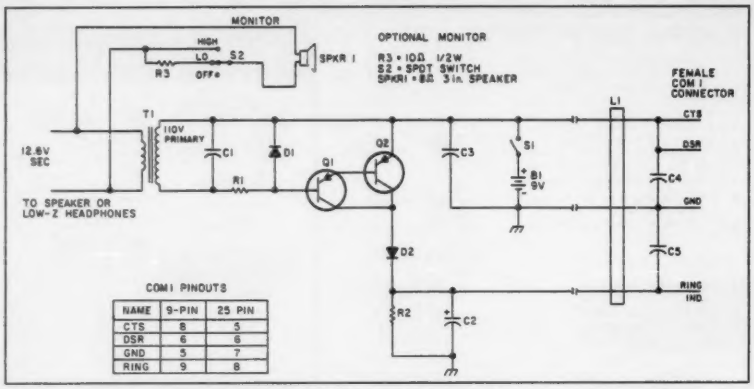

Figure 1. The ROBO-COPY interface.

The receiver should be in CW Mode, with the CW filter IN and the AGC control in the FAST position. Try tuning in a Q5 CW station, then reduce the RF gain to the MINIMUM needed to maintain solid copy. Increase the audio gain until the interface indicator LED blinks distinctly in sync with the audio. (RTTY sounds somewhat like high speed CW, but its coding and modulation schemes are different. ROBO-COPY does not copy any mode other than Morse CW.)

The screen should now be displaying the incoming code. For very fast or very slow code, one or two wrong characters may be displayed while changing its internal copy parameters.

One of the most common modifications to the nominal reception parameters is to change the letter timing. Although the recommended space between letters is three dits long, hams frequently shorten this time to as little as one and one-half dits long. The program boots up with the letter timing set at 1.7 dits, which gives the 3-dit spacing adequate margin. Some contesters and hams trying to sound fast tend to rush their timing and thus run their letters together. This practice is so common that I thought, despite comprehensive diagnostics, that there was a bug in the software. However, after a nearly perfect copy session with W1AW, it was proven that the timing was accurate.

The following sentence is an example of copy with short inter-character timing: "NAME 5 *C* ##" (It should read: "NAME IS RICK. QTH").

The telltale signs here are the presence of the error characters # (overrun) and * (invalid character). The overrun occurs when a few shorter letters combine into one letter over eight marks long. This concatenation of shorter letters can also result in invalid character combinations as well. Sometimes a number will be displayed when two letters falsely combine. For example, when the spacing between letters is too short, the word "is" (.. ...) can be mistaken for the number "5" (.....).

To adjust for this shortened timing, simply press the letter *L* (all commands can be either upper or lower case) and then press the "-" (minus or hyphen) key. The letter timing will decrease by 0.1 dit each time the "-" key is pressed. Once the correct timing has been achieved, the copy will become more readable.

If Letter timing is too short, letters will decompose into E's and T's corresponding to dits and dahs. The phrase SOS will appear as EEETTTEEE. Lengthen Letter timing by pressing *L* followed by the appropriate number of "+" (plus) key entries.

Misadjustment in the Word timing is more obvious. When *lettersruntogetherlikethis*, simply decrease word timing by pressing *W* followed by a "-" (minus or hyphen key). Word timing decreases by 0.5 dits for each time the "-" key is pressed.

If there *a r e t o o m a n y s p a c e s* between letters, increase Word timing by first selecting *W* followed by "+" (plus key) entries.

Just as you can change the Letter and Word timing to suit the timing of an individual's style, you can modify the Filter for different noise levels. The normal setting for the Filter is MEDium. This setting offers the best noise immunity without compromising speed. The LOW setting is best for high speed code re-

continued on p. 51

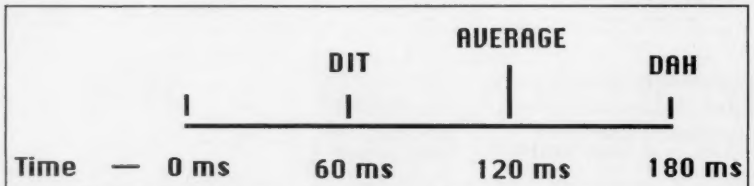

Figure 2. ROBO-COPY uses the deviation from an average value to distinguish between dits and dahs.

HF Equipment	Regular	SALE
IC-765 Xcvr/ps/keyer/auto tuner.....	3149.00	**2699**

IC-781 Xcvr/Rcvr/ps/tuner/scope 6149 **5199**

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FL-53A 250 Hz CW filter (2nd IF).....	115.00	**109**^{95}
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FL-32A 500 Hz CW filter.....	69.00	
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SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal; 751A, etc ...	79.00	
SM-6 Desk microphone.....	47.95	
SM-8 Desk mic - two cables, scan	89.00	
AT-100 100W 8-band auto. ant. tuner ...	445.00	**389**^{95}
AT-500 500W 9-band auto. ant. tuner ...	589.00	**519**^{95}
AH-2 8-band tuner w/mount & whip	758.00	**689**^{95}
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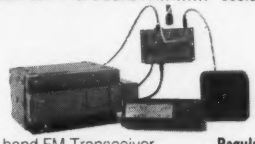
IC-3220A 25w 2m/440 FM/TTP mic...	659.00	**569**^{95}
IC-3220H 45w 2m/35w 440 FM/TTP	699.00	**599**^{95}
IC-1200A 10w 1.2GHz FM.... *(Closeout)*	699.00	**549**^{95}
IC-2400A 2m/440 FM/TTP ... *(Special)*	899.00	**699**^{95}
IC-2500A 35w 440/1.2GHz FM.....	999.00	**869**^{95}



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IC-3SAT 220 HT/TTP	449.00	**369**^{95}
IC-4SAT 440 HT/TTP	449.00	**399**^{95}
IC-2GAT 2m HT/TTP	429.00	**379**^{95}
IC-4GAT 440MHz, TTP	449.00	**389**^{95}
IC-32AT 2m/440 HT	629.00	**549**^{95}
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RC-11 Infrared remote controller....	70 99	
FL-32A 500 Hz CW filter	69.00	
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FL-44A SSB filter (2nd IF).....	178.00	**159**^{95}
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EX-310 Voice synthesizer	59.00	
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CK-70 (EX-299) 12V DC option.....	12.99	

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An Easy to Make 2 Meter Antenna

Make a strong J-Pole from an old TV antenna.

by Art Williams AA5KB

My new 2 meter rig, just purchased at a swap meet, needed an antenna. I wanted something that I could put on top of the 30-foot mast that supports my inverted vee's. I first considered a ground plane with a ⅝λ whip, but then I came across an old TV antenna with a folded driven element. I immediately saw a J-pole, already made except for cutting out and mounting!

The J-Pole

This version of a J-Pole antenna *will* withstand wind and weather. And, since the J-Pole does not require a ground plane, it's easy to make.

The design criteria is taken directly from the *ARRL Antenna Book, 14th Edition.* The antenna itself is literally a junk box design. I did not have to buy anything to build it—it is made from an old TV antenna having a folded driven element. (See Figure 1.) The metal is ⅜-inch aluminum tubing and since the driven element is folded, the loop part of the "J" is already formed. *[Ed. Note: If an old TV antenna is unavailable, you can purchase an inexpensive FM antenna with appropriate folded elements from Radio Shack—part# 15-1639. Although it will be much heavier, the "J" can also be made from a length of 3/8" copper tubing available from most hardware or building supply stores. Bend the tubing around a 2" pipe to form the "J" loop.]* Measure 19 inches from the loop towards the insulator and cut the tubing with a hacksaw. The long side should be 57 inches (3 x 19). You will likely find that you do not have 57 inches on that side. You must cut the tubing close to the other loop but in the straight portion of the metal. Cut a piece from some other element and splice the longer piece to make up 57 inches. There are some square sections coupling the straight elements to the main mast section and these can be used to couple the sections together. In my antenna, I welded the extension on to give a smoother appearance. You could also lap the extension over the main section and clamp them together with a small stainless hose clamp. Doing it this way allows you to experiment with the length of the main element.

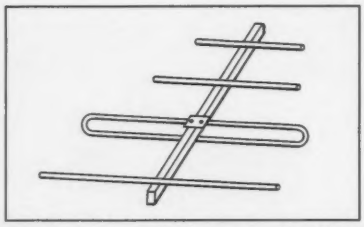

Figure 1. Use an old TV antenna with a folded driven element.

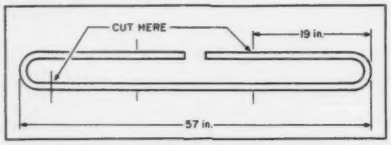

Figure 2. Tubing dimensions.

The next step is to make the mount. You need only a piece of PVC water pipe. I used a piece of ¾-inch 200 PSI pipe with a matching "T", but you could use schedule 40 or the gray electrical type. Some building supply stores sell PVC in two-foot lengths, which should be more than enough for the mount. I used an eight-inch piece for my horizontal mounting block. I began by drilling two ⅜-inch holes through the tube, the first about one inch from an end, and the second exactly two inches from the first, measured center-to-center. Yours could be slightly different depending on the separation of the short and long legs of the "J." You are going to slip the PVC tube over the two stubs, so the holes need to be exactly the same distance apart as the center of the stubs. Of course, the two ⅜-inch holes must be in line. A drill press is very handy for doing this but you can manage with a hand drill if you are careful.

Now slip the PVC tube over the long leg first and work it down to where you can slip the short leg through the other hole. It makes no difference which hole you start with. If you want the long leg toward the center of your mast, put it through the hole farthest from the end. This, of course, means that the short leg will come up through the hole closest to the end. Push the legs through to where about half of the short length is above the PVC tube. You can vary this; it's a matter of looks only.

Next, push the end of the PVC tube into the "T", as shown in Figure 3. Be sure to align the bottom of the "T" with the "J" pole. You can use PVC cement to secure these together or you can drill a couple of holes through the two and put in self-tapping sheet-metal screws.

You are now ready to mount the "T" in the top of your mast. You may find in your case that you want to put a piece of PVC tubing in the bottom of the "T" and secure that to your mast. You could, for instance, put a foot or so on the bottom and then clamp that to a steel mast with hose clamps. If you do it that way, put something in the center of the bottom piece so you don't crush the PVC with the clamps. In my case, I was able to mount the "T" directly into the top of my 30-foot push-up mast. I first cut cross slots in the top of the mast, down about one inch. I next slipped a stainless steel hose clamp over the end of the mast and then worked the bottom of the "T" into the mast. Tightening up the hose clamp, causing the end of the mast to squeeze in around the "T", completed the mounting.

Now you will need two ⅜-inch clamps to connect the coax to the legs of the "J" pole. I made mine out of scrap strips of aluminum, about ⅜-inch wide and two inches long. I bent them around a scrap piece of tubing and squeezed the ends down with a pair of vice grip pliers. Then I drilled a hole through the flats for # 6 machine screws. Keep in mind that you want the clamps to be tight when you secure them but you also want to be able to loosen them to adjust for best SWR. *Continued on page 67*

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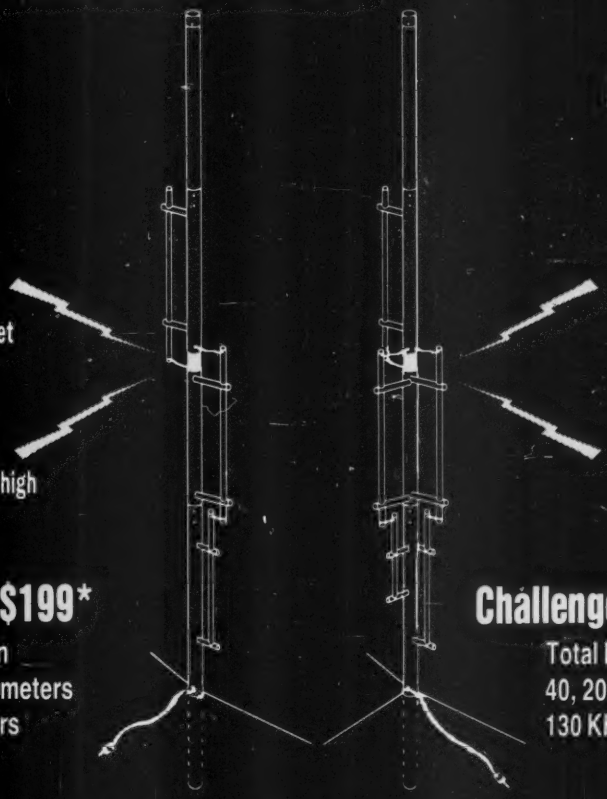

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CIRCLE 373 ON READER SERVICE CARD

Solar Car Race

Searching for an alternative.

by Bill Brown WB8ELK

Since the invention of the motorcar, the desire to achieve peak performance has been one of the main challenges among automotive engineers and designers. The car race has been one of the most instrumental ways to push technology to the limit and help spur some real progress in automobile design. Most of this effort has been put into improving the gas-guzzling combustion engine. There is an alternative.

Schools across the nation have been experimenting with solar-powered vehicles. Recent advances in the efficiency of solar cells, electric motors and drag-efficient vehicles have made the practical solar-powered car a near reality! Many of these schools need actual road test data to continue with their research. What better way than to pit their car against the designs from other schools in a solar car race!

Photo A. ConVal HS "Sol Survivor" solar car.

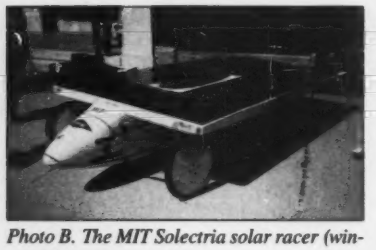

Photo B. The MIT Solectria solar racer (winner of the racing category).

To this end, the Northeast Solar Energy Association organized the second annual American Tour de Sol race. The objectives of the five-day race from Montpelier, Vermont, to Boston, Massachusetts, were to: 1. Promote solar energy and electric vehicles; 2. Provide a vision of future transportation and solar energy use; and 3. Provide a challenging design problem for engineering students.

Most of these vehicles were capable of traveling at road speeds over 50 mph and over a 50-mile range. The practical solar-powered commuter car is almost here! Since these are experimental vehicles being pushed to the limit over a 234-mile course, breakdowns can and offen do occur. Maintenance crews from the various teams needed to know where to respond to help out their entry. Occasionally, some of the cars needed to be towed to the finish line as well. In order for the race director to keep track of each vehicle and its progress, a massive communications effort was necessary.

Hams to the Rescue

Hams from three states and several different radio clubs responded to the challenge! Each day the cars set out on a 30–60-mile course. Hams would set up at checkpoints along the route and report the cars' progress to the race director. Each day of the race, the next radio club or group down the line took over for their area.

Photo C. Daryl WB1DXN operating from the Lake Massabesic checkpoint.

Fifteen solar vehicles started the race from Montpelier, Vermont. Six members of the Central Vermont Amateur Radio Club ushered the racers on their first day as they headed towards New Hampshire. Bob WB1AJG was instrumental in organizing the first-day effort and helped locate any stragglers near the end of the day. Due to the distances covered and the mountainous terrain, three 2 meter repeaters were used to coordinate the effort.

Once in New Hampshire, the NHARA (New Hampshire Amateur Radio Association) took over. The NHARA is a public service organization which draws on the resources of various New Hampshire radio clubs to cover large events like this one. Daryl WB1DXN organized the first leg of the race into New Hampshire and the cars' arrival in the state capital of Concord, with the aid of a dozen volunteers. Coordination was done on the Hanover repeater with Cal WA1WOK operating as net control.

Photo D. Michele Cabana KA1SOA reports the position of a breakdown.

One of the longer legs of the race was from Concord, New Hampshire, to Lowell, Massachusetts. Members of the Interstate Repeater Society (IRS) teamed up to establish 15 checkpoints with a couple of roving mobiles. Daryl WB1DXN and Chick KC1OX kept the race director updated at the midway point at Lake Massabesic. Warren WB1HBB operated as net control from his home. Repeaters in Concord and Derry, New Hampshire, and Lowell, Massachusetts, were used to coordinate the whole effort. At this stage of the race at least three of the solar cars broke down. Some of them had to be towed to the finish line.

None of the solar cars broke down during the final leg of the race. The communications

Photo E. The solar bike. (Photo courtesy of Warren WB1HBB and Donna KA1RWZ.)

effort was organized by Bob WA1IDA who enlisted ten members of the Amateur Radio Support Team. Each Support Team mobile travelled along behind two of the solar racers to help bring them in to cross the finish line at Tufts University in Medford, Massachusetts.

I watched with fascination, during the fourth day of the race, from the starting point at Concord. All of the entries were engineering marvels. However, three of these really attracted my attention. I loved the name of the car entered by Delta College..."S-CAR-GO" (Solar Car Go). Another enthusiastic entry was from ConVal High School *[Ed. Note: Just down the road from 73!]* The students from ConVal proved that you don't have to have the backing of a university or college to make it through a grueling race such as this. Their vehicle, "Sol Survivor," lived up to its name and came in fourth in its category! Finally, one of the most unique vehicles was the solar-powered bicycle operated by Team Rosebud. The rider had a solar panel strapped to his back which ran a small electric motor attached to his wheel. Hmmm...Maybe next year I'll bring my solar-powered skateboard! 73

The Contenders

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Delta College
Dartmouth College
MIT
Solectria Corp.
New Hampshire Technical Institute
University of Lowell
University of California, Irvine
Solar Car Corp.
Sundriver, Inc.
Team Rosebud
Tufts University

Next year's race is scheduled to run from Albany NY to Boston MA. For more information contact the Northeast Solar Energy Association, 23 Ames St., Greenfield MA 01301. Phone: (413) 774-6051.

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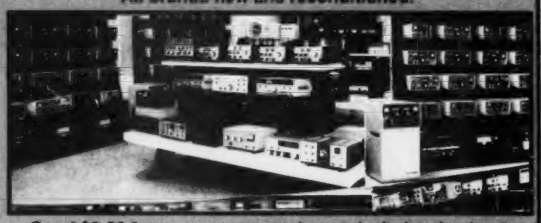

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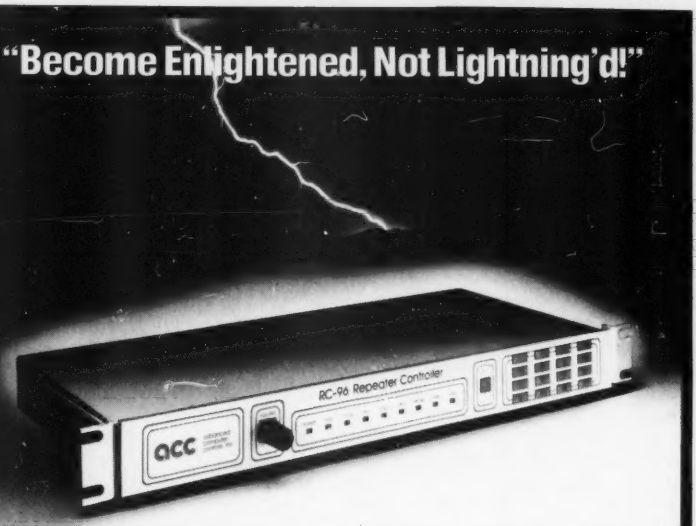

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CIRCLE 1 ON READER SERVICE CARD

73 Review

by Richard Morrow K5CNF

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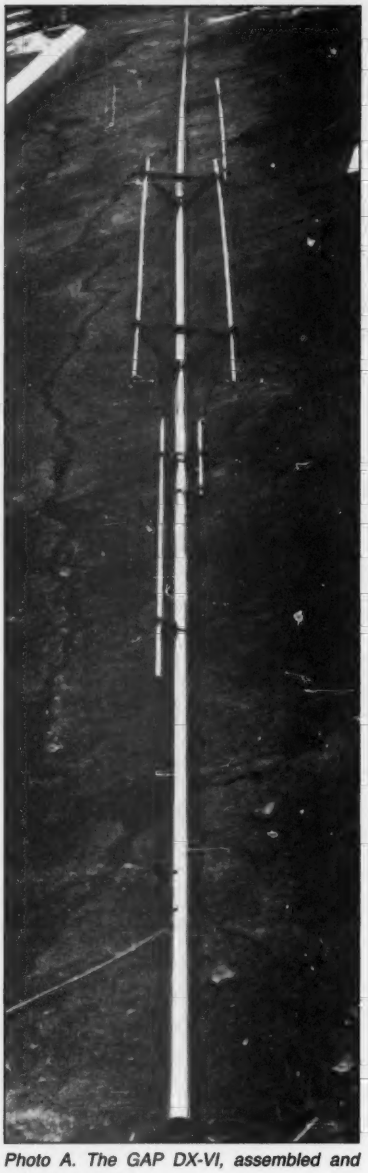

Photo A. The GAP DX-VI, assembled and ready to install.

As soon as I received the GAP DX-VI courtesy of UPS, I hastened to open the box and get the antenna up. But it rained for three days, starting the instant I popped off the first staple. After the monsoon subsided, I assembled the 31.5-foot high antenna on the driveway (see Photo A), which took about an hour and a half—more than just the thirty minutes called for in the instructions. I found the antenna to be well-built, and manufactured of high grade tubing and stainless steel hardware.

George KK4CW, who dreamed this antenna up, informed me that a better instruction manual will be out shortly. If you take your time and don't have to fight mosquitos, you should be able to put the antenna together in about 45 minutes to an hour, or even less. Study the diagrams and sketches carefully first, read the directions and follow them, and you will have no problems. To keep track of the elements, you might also want to mark each section with a marker.

All sheet metal screws and washers come packaged in a Ziploc plastic bag with a nut driver. However, I would advise you to use either a power screwdriver or socket wrench, as you can wear out your hands screwing the antenna together. Be careful to get all the screw holes aligned. To slow down corrosion, I also advise an application of weatherproof coating on each screw and electrical connection, especially if you live near the ocean or in a place where it rains a lot.

Installation

As soon as you have the antenna correctly assembled, you need to put the base section in place. The instructions call for mounting the base section in concrete. I didn't have any concrete, so I used a spare brick. I pounded it into the mud as deep as I could. Crude, but it worked. If you resort to the "pound in the ground" method, put a board over the base section to keep from mangling the top end.

Once the base section is installed and stable, the next step is to raise the antenna into position on the base section. Follow the instructions, and get some help—unless you are built like me, a beer barrel with legs. It's an easy installation with two people, but with just one person the antenna can get away from you and could cause some grief. Be sure to watch out for power lines, too.

Although the antenna is self-supporting, you might consider using insulated guy ropes. Wind can do funny things when you least expect it.

The GAP DX-VI has NO base insulator or coils. This is just one of the things that makes this antenna different from a regular vertical antenna.

Rising Above it All

The 36-ohm base impedance of a normal vertical antenna has to be matched to the 50-ohm transmission line with a matching network. Resistance in the coil of the matching network increases loss. If you use a capacitive matching network, capacitive loss to ground increases at the feedpoint. This means that some of your transmitted power is going to ground currents due to capacitive coupling, instead of into the air, where it should be going.

The GAP antenna's feedpoint is located about 16 feet above the ground. Why? By raising the feedpoint above ground, the coupling to ground is reduced to an absolute minimum, and so is that nasty capacitive coupling. More of your signal gets into the air. This works because, if you go up the antenna from the base, measuring resistance, you will find a point at which the resistance is 50 ohms.

Sixteen feet above ground is also above most RF-absorbing items, like hurricane fences and cars. And the chance of base-loading passing dogs is nonexistent. Other factors that can affect feedpoint resistance in other antennas, such as soil condition and ground moisture, do not seem to affect the GAP antenna at all. As a matter of fact, I was on the air recently during a very heavy rain, and the SWR didn't change, unlike other verticals I have used.

No Tuning? No Radials?

Another very good thing about the GAP antenna is that you don't have to tune it. It comes out of the box tuned. Also, you don't need radials.

To work 75/40 meters, you need three 25-foot long counterpoise wires (insulated) to make the antenna longer on the two lower bands. If you cut a foot off the counterpoise wires, the current node on 40 meters moves higher up the antenna, cutting losses on that band. I verified this with the old florescent light bulb trick—I waved a small fluorescent bulb up and down the antenna to see where it was most brilliant. Not very scientific, but it works. Just be sure a nonham doesn't see you, as you could end up under a net.

Counterpoise wires for 40 meters usually have to be about 32 feet long, but not with the GAP. If you don't operate on the lower bands, you don't need the counterpoise wires; I verified this by removing the wires. They didn't make any difference at all on 20–10 meters.

The entire antenna radiates on all bands. An antenna that radiates over its entire 31.5-foot length on each band is a lot more efficient than one that radiates from a different part for

each band. The capture and radiating areas are greatly increased on the higher bands.

Into The Fray

On 75 meters, the GAP was compared to a monoband antenna designed by Ted Hart W5QJR. On 75 meter European DX, both antennas do very well, with the QJR antenna about 2 S-units above the GAP. Keep in mind that the QJR antenna was cut for ONE band and has maximum efficiency on 75 meters. The GAP was much closer to the fence and some other items that didn't help it do as well on 75. Still, it did much better than other antennas I've used on this band. Bandwidth on 75 meters was an impressive 150 kHz for a good SWR. [*Ed. Note: An interchangeable tuning cap mounts on the top of the antenna which determines the resonant frequency on 75 meters. The GAP can be ordered centered on 3.6, 3.7, 3.8, 3.9 MHz or a custom frequency of your choice.*]

Forty meters was just fine, and I made enough contacts during the day to tell me that the antenna would do well at night when Europe would start rolling in. Sure enough, the shortwave broadcast stations came in like thunder. On the low end of 40, I heard many stations, both SSB and CW from EA3 to YO3. There were a lot of UA stations, and I heard a call I'd never heard before—UZ1. I missed the rest of the call due to the ensuing pileup. The old Mosley V4-6 never worked this good.

On 20 meters, using just 32 watts PEP I managed to maintain a QSO with VK2FA in Newcastle for about 25 minutes. Brian was coming in between S6–7, and I was on the order of S2-5. I never missed a word.

I made several more contacts, and I was satisfied that this is a real DX antenna. I tuned around and heard signals from all over the globe. OE6MKG was running 20–30 over until the gray line passed his location and the sun came up. GB2SDD was running 10 over, and had a pileup going. It was really surprising to hear so many signals under what could be called dead band conditions.

20 meter CW was the same story, lots of weak but readable DX stations. I heard a flock of calls from the Soviet Union and other parts of the world that I did not recognize. I finally went to sleep about 2:30 a.m., thinking that if my QTH was in a better location, the GAP would be the answer to a poor DX Hound's prayers. I live in what some hams call an RF sponge—my house is surrounded by power lines, TV cables, a shopping center, and a large dairy processing plant.

Operation on 15/10 revealed the same thing. All sorts of DX was coming in, and I made enough contacts to prove to me that the GAP antenna is an excellent DX antenna. I was not able to operate the WARC bands, as the age of my rigs rules that out.

Further observation revealed that the antenna is much quieter than the other verticals I've used. I didn't hear any ignition noise on 10, even though there is a major freeway about a mile from the house and a very busy major throughfare less than 300 feet from my front door.

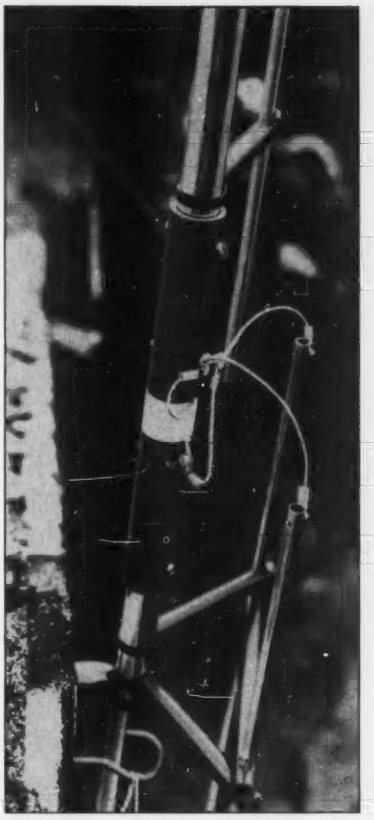

Photo B. The feedpoint, 16 feet above the ground, circumvents the need for an impedance matching network.

Impressions

Usually, broadband antennas are not very efficient, but this one is. Since the antenna is ground independent, all you need for 75/40 is the three counterpoise wires, as mentioned, which you can string in any manner as long as they do not double back on themselves or cross each other.

If you do any shortwave listening or other monitoring in the 3.5–30 MHz range, this antenna will perform very well.

This would be a good antenna for portable use. Since it doesn't have to be tuned, set-up would be easier. You'd need a stout carrier for rough handling, but you could make one out of heavy PVC. Also it's a good idea to bring along a friend to help lift it into position.

Since it is a vertical, the GAP DX-VI will not do as well as a dipole for close-in work (under 800–1000 miles or so), but it will do better than a dipole for QSOs over 1000 miles away. It works on 2 meters, too!

The GAP antenna performed a lot better than others I've used. If I could have only one antenna, I would definitely rather have this one. The lack of lossy coils, and the coverage of a very wide part of 75 meters by an all-band vertical, impressed me more than a little! 73

Richard Morrow K5CNF, 1706 Melisa Lane, Corpus Christi TX 78412.

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CIRCLE 332 ON READER SERVICE CARD

Service Survey Wrap-Up

Plus—where to get your old rig fixed.

by Gordon West WB6NOA

In the last six months we've taken an inside look at the factory repair service of Kenwood, Yaesu, ICOM, Ten-Tec, and Alinco. Visiting these companies and learning about what it takes to get your set fixed quickly and completely was an eye-opener. Although each company is unique in its approach to the repair of amateur radio equipment, this six-month survey reveals that the leading manufacturers of amateur radio equipment agree unanimously on the following points:

Manufacturer to Ham

1. IMPROVE YOUR CORRESPONDENCE. The amateur radio service centers want precise details about the radio's problem. Simply taping a "doesn't work" note to the top of the radio is not enough. Give a clear description of what the problem is, whether it is continuous or intermittent, any identifiable conditions under which the problem occurs, the length of time you've had the problem, and any other history that might be relevant. This information will help the technician repair your equipment more quickly and for good.

Better yet, copy and fill out the "Amateur Radio Equipment Repair Request" form that's in the March 1990 issue of *73*. If you don't have this issue, you can order it. If you only want a copy of the form, call or write *73 Magazine* and ask for one.

2. PACK IT BETTER. Because of poor packaging, many radios are damaged while on their way to the service facility to be repaired. This compounds the service problem. You may have sent the radio in for a new volume control pot, but when it arrived, it also needed a whole new circuit board. Like me, you probably threw the original boxes away a month or two after you bought your rig, but you can still take it to a professional packaging and shipping service. Let a professional bundle it up and ship it out, insured.

Hal Guretzky K6DPZ of Land Air Communications suggests that you do NOT label your package "electronic equipment," "ham radio gear," or anything similar. Occasionally, such boxes disappear. If you wish to write something on the box, FRAGILE will do.

3. NO ACCESSORIES, PLEASE. "But I didn't get my little rubber duckie antenna back!" This is a common complaint. Somewhere out there in the radio world there must be some technicians with the largest supply of rubber duckies on Earth. It's easy to forget that you shouldn't send a radio back with everything that came with it. But battery packs, rubber duckies, jack rubber plugs, straps, and similar items, can get separated from the radio during repair.

4. BETTER PHONE NUMBERS. Many times the service manager or bench technician may need to call you during the day to ask a question about your equipment. Be sure to leave your best daytime phone number for them to get in touch with you. Since most technicians don't work at night, your home phone is usually not a good choice. Don't think for a second that they're going to call you at home on Saturday or Sunday, either.

5. BE TRUTHFUL. If someone accidentally spilled a martini in your TS-950, include this in your letter requesting service. Chances are the technician will find the olive anyway—but it may take longer. If you try to camouflage the cause of the problem with an excuse, the technician may look for the problem in the wrong place, delaying the repair and increasing the chance of an incomplete repair.

Photo A. The test benches at Land Air Communications are equipped to repair the latest as well as the oldest rigs.

Photo B. Hal Guretzky K6DPZ says it on his license plate.

Ham to Manufacturer

But wait a minute, Mr. Manufacturer/Service Center; hams are also in complete agreement on some points that you may need to ponder:

1. A MORE COMPLETE REPAIR. Many readers wrote that only one or two out of four or five problems were completely repaired. Fixing the obvious is easy. Technicians should spend a few more minutes reading over their paperwork for other faults occurring with the rig under repair. They should also read over the customer's letter carefully.

2. BETTER REPAIR DOCUMENTATION. No ham likes to get his handheld transceiver back with a bill for $150 with little or no explanation about what was done to it. *That* much just to change a tiny 1N914 diode? Better back up big

INTRODUCING OUR NEW COMPUTER-CONTROLLED

REP-200 REPEATER

If you always thought a computer-controlled repeater had to be expensive, LOOK AGAIN! You could easily spend this much just for a controller.

As always, Hamtronics strives to give *superb performance* at *modest cost!* In this case, a premium repeater with versatile computer control, autopatch, and many dtmf control features at *less than many charge for a bare-bones repeater!*

We don't skimp on rf modules, either! Check the features on R144 Receiver, for instance. GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.

We completely re-thought the whole idea of what a repeater should be, to give the *best features* at the *lowest cost*.

ONLY $1295!

- Available for the 10M, 6M, 2M, 220MHz, 440MHz, 902MHz ham bands. *FCC type accepted models also available for vhf and uhf commercial bands.*
- **Rugged exciter and PA**, designed for continuous duty.
- Power output 15-18W (25W option) on 2M or hi-band; 15W on 220MHz; 10W on uhf or 902MHz.
- Accessory add-on PA's available with **power levels up to 100W.**
- **Five courtesy beep types**, including a pleasant multi-tone sequence.
- **AUTOPATCH**: either **open or closed** access, **toll-call restrict**, auto-disconnect.
- **Reverse Autopatch**, two types: auto-answer or ring tone on the air.
- **DTMF CONTROL**: over 45 functions can be controlled by touch-tone. Separate 4-digit control code for each function, plus extra **4-digit owner password**.
- **Owner can inhibit** autopatch or repeater, enable either open- or closed-access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options, including two auxiliary external circuits.
- The cwid message, dtmf command codes, and owner-specified default parameters for cor and cwid timers and tones are burned into the eprom at the factory.
- Cw speed and tone, courtesy beep and tail timers, and courtesy beep type **can all be changed at any time** by owner-password-protected dtmf commands.
- Many **built-in diagnostic** & testing functions using microprocessor.
- Color coded led's **indicate status** of all major functions.
- **Welded partitions** for exciter, pa, receiver, and controller. PEM nuts for covers.
- 3-1/2 inch aluminum rack panel, finished in eggshell white and black.
- **Auxiliary receiver input** for independent control or **cross linking repeaters.**

There are many other features, too numerous to mention. Request catalog for full details.

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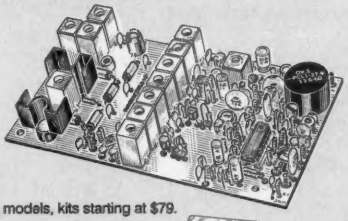
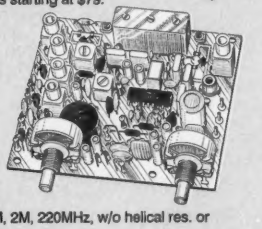
FM EXCITERS: kits $99, w/t $169. 2W continuous duty. TCXO & xtal oven options available. *FCC type accepted for com'l uhf & hi bands.*

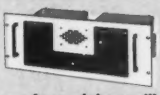


- **TA51** for 10M, 6M, 2M, 150-174, 220MHz.
- **TA451** for uhf.
- **TA901** for 902-928MHz, 0.5W out (w/t only, $169).
- **VHF & UHF AMPLIFIERS.** For fm, ssb, atv. Output from 10W to 100W. Several models, kits starting at $79.

FM RECEIVERS: kits $139, w/t $189.



- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift.
- **R451 UHF FM RCVR**, similar to above
- **R901 902-928MHz FM RCVR.** Triple-conversion. GaAs FET front end.
- **R76 ECONOMY FM RCVR** for 10M, 6M, 2M, 220MHz, w/o helical res. or afc. Kits $129.
- **Weather satellite & AM aircraft rcvrs** also available.



If you prefer a plain-vanilla or kit repeater, you couldn't find a better value than our original

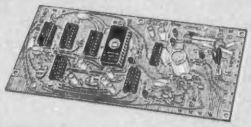
REP-100 REPEATER

Same fine rf modules as REP-200 but with COR-4 Controller. Can add autopatch, dtmf decoder, CTCSS, either now or later. **Kit only $675, w/t $975.**

ACCESSORIES

COR-3 REPEATER CONTROLLER kit. Features adjustable tail & time-out timers, solid-state relay, courtesy beep, and local speaker amplifier $49

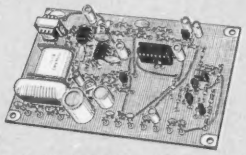
CWID kit. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 ..... $59



***NEW* COR-4** kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call .. $99

***NEW* TD-3 SUBAUDIBLE TONE DECODER/ENCODER** kit. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions $24

TD-2 TOUCH-TONE DECODER/CONTROLLER kit. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! $79



AP-3 AUTOPATCH kit. Use with above for repeater autopatch. Reverse patch & phone line remote control are std . $79

AP-2 SIMPLEX AUTOPATCH Timing Board kit. Use with above for simplex operation using a transceiver $39

MO-202 FSK DATA MODULATOR kit. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. $39

DE-202 FSK DEMODULATOR kit. For receive end of link. $39

9600 BAUD DIGITAL RF LINKS. Low-cost packet networking system, consisting of new MO-96 Modem and special versions of our 220 or 450 mHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W. *Call for more info on the right system for your application!*

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at a fraction of the cost of comparable units!

LNG-(*)

***ONLY* $59** wired/tested

FEATURES:

- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
- **Wide dynamic range** - resist overload
- **Stable:** low-feedback dual-gate FET

**Specify tuning range: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.*

LNW-(*) MINIATURE GaAs FET PREAMP

***ONLY* $24**/kit, **$39** wired/tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, or 400-500 MHz.*

LNS-(*) IN-LINE PREAMP

***ONLY* $79**/kit, **$99** wired/tested

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

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Preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRA-(*)**, $49 vhf, $94 uhf.

**Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-450, 450-470.*

RECEIVING CONVERTERS

Low noise converters to **receive vhf and uhf bands on a 10M receiver.** Choice of kit with case & BNC jacks, kit with pcb only, or w/t unit in a case. Other models available for other in/out ranges & atv. *Request catalog for complete listings.*

VHF input ranges avail: 136-138, 144-146, 145-147, 146-148, 220-222, 222-224; kit less case $39, kit w/case $59, w/t in case $89.

UHF input ranges avail: 432-434, 435-437; kit less case $49, kit w/case $69, w/t in case $99.

902-928 MHz converts down to 422-448 or 430-450 range. Same price as uhf.

TRANSMITTING CONVERTERS

XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 6M, 2M, 220, 432, 435, and for atv. 1W output. **Kit only $79.** PA's up to 45W available. *Request catalog for complete listings.*

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CIRCLE 57 ON READER SERVICE CARD

bills with details on what you're charging the customer for.

3. KEEP ME INFORMED. Nothing is more aggravating than not knowing whether the factory received the rig or not, how long it's going to take to get it fixed, and an accurate estimate of how much it will cost. When the unit is received, every company should immediately send a postcard to the customer, indicating receipt of the equipment, with instructions on how to track the unit down for a status check. The postcard should also state the estimated time and cost of the repair. If the unit is being shipped back to the customer C.O.D., does C.O.D. mean cash or a cashier's check, or is a personal check OK?

Land Air Communications L.T.D.

Older sets may be fixed quickly if the parts are still available and a technician takes a special interest in the project. Originally, this last service survey article was to include a tour of the service center of G.E. Electronic Services. Since last July, however, G.E. is no longer repairing amateur radio equipment, new or old.

East Coast hams are luckier. Hal Guretzky K6DPZ, owner of Land Air Communications, says, "We specialize in used equipment, both sales and service." While I haven't had a chance to personally inspect his facility, I did receive letters from several readers indicating that Land Air Communications fixed their equipment, which had been pronounced dead by others.

Hal Guretzky has plenty of used gear for sale, plus elaborate test benches which meet the requirements for a well-equipped repair facility for the latest models of microprocessor-based ham transceivers. Says Hal, "My formula for repairs is: If the cost of the repair is more than half of the used replacement cost, the customer will be informed, and he has the option to have the rig repaired or not. If he chooses not to, the only charge is the cost of shipping the equipment back to him."

Hal's reputation is known across the U.S. Repairs come in from as far away as California. According to Hal, his license plate says it all (see Photo B). For more information, call or write Land Air Communications at 95-15 108 St., Richmond Hill NY 11419. Tel. (718) 847-3090. FAX (718) 849-8279. Add them to your arsenal of independent fixers.

That's it, folks. Half a year of exploring a dreaded subject—radio failure and how to get it fixed quickly. Hams are quite vocal about the kind of repair service they get from manufacturers and service centers. While the major manufacturers provide good service, turnaround time may vary with a shortage of qualified technicians. And as Wayne Green has pointed out so aptly in his editorials, good service technicians are getting harder and harder to find.

Do your part to get good service. State your problem clearly, pack your rig up well, ship it out right away, and chances are you'll get your rig repaired in a reasonable amount of time.

Enjoy NEVER CLIMBING YOUR TOWER AGAIN

Are you too scared or too old to climb? Never climb again with this tower and elevator tram system. Voyager towers are 13 and 18 inch triangular structures stackable to any height in 7 1/2', 8 3/4' or 10' section lengths. Easy to install hinge base, walk up erection. Next plumb tower with leveling bolts in base. Mount rotor and large heavy beams on Hazer tram and with one hand winch to top of tower for normal operating position. Safety lock system operates while raising or lowering. At last a cheap, convenient and safe way to install and maintain your beam. This is a deluxe tower system that you can enjoy today.

SPECIAL TOWER PACKAGE: 50 ft. high by 18" face tower kit, concrete footing section, hinged base, HAZER kit, Phillystran guy wires, turnbuckles, earth screw anchors, 10' mast, thrust bearing, tool kit, ground rod and clamp, rated at 15 sq. ft. antenna load @ 100 MPH, **$1974.95.**

50' by 13" wide tower, same pkg as above	$1670.95
HAZER 2 for Rohn 25-hvy duty alum 12 sq ft wind ld	324.95
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TB-25 Ball thrust bearing, 2½" max mast dia.	74.95
NEW NEW NEW NEW NEW NEW	
HAZER VH-8 Transit System for Rohn 45, 22 sq ft wind load	860.00
HAZER VH-9 Transit System for Rohn 55, 22 sq ft wind load	895.00

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Packet-PLUS runs on IBM Compatible computers. It supports multi-session operation, Packet, AMTOR, Baudot, ASCII, NAVTEX, Morse and the latest AEA Firmware. Huge Scroll back buffers, Binary and Text file transfer, QSO logging, and more.

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CIRCLE 77 ON READER SERVICE CARD

Where's the Beam?

There's a 20 meter DX HalfSquare slung between this tree and the peak of the roof. Ten and 15 meter HalfSquares hang under the eaves of the house. The neighbors haven't noticed. But the DX hears me anyway. That's nice. My HalfSquares are heard, not seen. They work DX without a tower, without an amplifier, and without telling the neighbors. When you order add $5 P&H.

10 M	15 M	20 M	40 M
$39.95	$44.95	$49.95	$69.95

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2 theory tapes, 2 textbooks, FCC Rule Book, 4 code tapes, code oscillator set, examiner test packet, and over $50 in radio discount coupons.

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#19	5 wpm Novice QSO tests
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#25	12-15 wpm Calls & Numbers
#26	13 wpm Random Code
#27	13 wpm Test Preparation
#28	13 wpm Car Code
#29	13-15 wpm Speed Builder
#30	15-17 wpm Speed Builder
#31	17-19 wpm Speed Builder
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CIRCLE 31 ON READER SERVICE CARD

The ZED LOOP Special

An inexpensive HF beam with a new twist.

by Jim Gray W1XU

The "ZL Special" antenna, named after ZL3MH who first designed it, is well-known to enthusiasts who want a simple, easy-to-build, inexpensive, high-performance wire beam. Basically, the ZL Special consists of two folded dipoles fed out of phase to provide a strong radiation lobe in one direction, and signal cancellation off the back. It is a slightly different version of the famous "8JK" antenna designed and published by John Kraus W8JK in the 1930s. John's articles appeared in *QST* between 1935 and 1938, and more recently in 1989. Another tried-and-true version of the ZL Special appeared in "Broom Handle Beam," written by John J. Scultz W4FA in the January 1989 issue of *CQ*.

The Ideas Click

My own experience with the ZL Special goes back to 1958, when I built one from twin-lead, using vinyl tape to attach the elements to some bamboo poles. These, in turn, I attached to a small wooden framework that could be rotated by a light-duty TV rotator. I fed the beam with 75 ohm coaxial cable and used it with remarkable success on 15 meters.

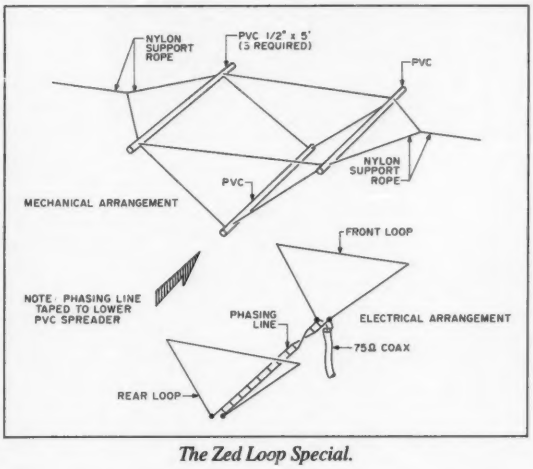
With the advent of the new sunspot Cycle 22, and the sudden and drastic increase in 10 meter activity, I decided that I'd need a beam for my QTH, which is on a small, tree-covered lot with no tower or possibility of one at present. I considered using a 20 meter delta loop beam I'd made for DX back in New Hampshire.

That one had quarter-wave spacing between the elements and a neat design for changing direction from the shack by merely switching an extra quarter-wave length of coax into the feeder arrangement. I could instantly change the direction of the beam by 180 degrees. It worked very well, and got me some new countries in spite of my 100 watt transceiver.

Then the idea clicked: Why not incorporate the best of both antenna systems—a delta loop pair, separated and phased in the ZL Special manner? I devised (on paper) a suspension system for making it into a fixed-direction antenna—the better to work those elusive Europeans from Arizona, and also to enable me to work my old friend N1DQM back in New Hampshire. The result is shown in the figure.

A 10 Meter Version

I used the formula of 1005/F (MHz) for the forward element and 1055/F (MHz) for the rear element. Obviously, both elements are "driven." I used a physical spacing of 5 feet between delta loops, and a 6-foot length of 450-ohm ladder-line as the phasing section. *Formula = 150/f for 450 Ω line length and 120/f for loop spacing*. (If you wish, you can make the phasing line from 300 ohm twin-lead, although it will have a slightly shorter length.)



The Zed Loop Special.

As you can see, the coax cable is attached without a balun (although you may use one if you wish) to the junction of the forward loop and phasing line. You will notice that the phasing line has a half-twist in order to place the antenna currents in the proper phase relationship to give forward gain and backward rejection. I reasoned that the loop arrangement would give slightly more gain than the folded dipoles and provide the inherent quietness of a loop, plus the broad-banded nature provided by their low *Q*. The dimensions of the loops themselves turned out to be 35′ for the forward element and 37′ for the rear element, at 28.5 MHz.

The design, sketching, and calculating took about two hours in the evening, and the construction, assembly and erection took two hours in the afternoon of the following day. I used ½" PVC pipe from the hardware store for the spacers (at a cost of $4.34 including tax) and nylon line for the supporting ropes. The wire for the loops and the 450 ohm phasing line were salvaged from other antennas. If you have to buy everything new, you can put this antenna together for 10–15 dollars.

After hoisting the beam to its resting height of 25 feet in a hammock-like position, I connected the transceiver and listened. Wow! Signals were pouring in from all over the Northeastern U.S. with strengths of at least 1 to 2 S-units greater than my vertical antenna. A few calls produced as many replies, and those with whom I spoke all wanted more information—hence this article.

Dimensions of the Zed Loop Special

Band/Freq.	Reflector	Driven Element	Phasing Line	Spacing
Formula used:	*(1055/F MHz)*	*(1005/F MHz)*	*150/F MHz*	*123/F MHz*
10 M/28.5 MHz	37 ft.	35 ft. 3 in.	5 ft. 3 in.	4 ft. 4 in.
12 M/24.9 MHz	42 ft. 4 in.	40 ft. 4 in.	6 ft.	5 ft.
15 M/21.3 MHz	49 ft. 9 in.	47 ft. 5 in.	7 ft. 1 in.	5 ft. 8 in.
17 M/18.1 MHz	58 ft. 3 in.	55 ft. 6 in.	8 ft. 3.5 in.	6 ft. 9.5 in.
20 M/14.2 MHz	74 ft. 4 in.	70 ft. 9 in.	10 ft. 6.75 in.	8 ft. 8 in.

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ACDC Electronics# 12N5
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Open frame power supply. 7" X 4 3/4" X 3" high.
Regulated. CAT# PS-125 $37.50 each

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Rubicon CE photoflash capacitor.
0.79" dia. X 1.1" high. These are new capacitors that have been prepped with 1.4" black and red wire leads soldered to the terminals. CAT# PPC-210
$2.50 each • 10 for $22.50 • 100 for $200.00
Large quantities available. Call for pricing.

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Diffused L.E.D. with built in flashing unit. PULSE RATE: 3 Hz @ 5 Volt/20 ma. Unit continually flashes when 5 Volts is applied. Operates between 4.5 Volts and 5.5 Volts. T 1 3/4 size.
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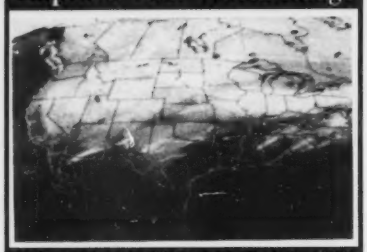

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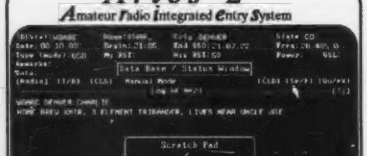

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The feedpoint impedance was such that I had a VSWR of 1.4:1 at the 28.500 MHz design frequency. This was maintained all the way down to 28.000 MHz. The VSWR increased to 2:1 at 28.8 MHz—yielding an effective bandspread of about 800 kHz for this antenna. Perhaps by "centering" it a bit higher, I could have easily covered the entire 10 meter band with an acceptable VSWR. As a matter of fact, I have used it on 12 meters (with an antenna tuner) and received excellent reports. It does appear to have almost equivalent directivity on 12 meters, but this has not yet been fully determined. For best results, I would recommend a version cut especially for 12 meters. See the table for dimensions.

The length of the phasing line depends on the velocity factor of the material used. For example, the velocity factor for 450 ohm ladder-line is taken to be about 0.92. The formula 150/F as shown in the table is empirically derived, and seems to work well.

You may try different lengths of phasing line to change the F/B ratio or the forward gain of the beam—or even the feedpoint impedance.

Loops may be triangular (delta loop), square (quad loop), round (circular loop), or any other regular, convenient polygon. You may wish to try feeding your loops at a different point to take advantage of polarization diversity. Both loops should be fed at the same point, however. Feeding the vertical side of a quad loop gives vertical polarization, while feeding the horizontal side gives horizontal polarization. If you use a true delta loop (point up), feed one bottom corner; if you use an inverted delta loop (point down), feed the point or the middle of the top side. Experiment for best results.

Good Gain, Easy Mount

Results so far are very encouraging; the stations I've worked have given me extremely favorable S-meter reports. I only have a problem when I want to beam a signal in the other direction. This requires unfastening the hammock from its end support ropes and physically turning it around and re-hoisting it. Tedious, yes, but not all that bad, really.

What is the gain? Compared to my vertical, I see about a 2 to 3 S-units improvement on receive. That's ridiculous, I know, so let's say about 4 to 5 dB relative to a dipole—perhaps a tad more. The front-to-back ratio appears to be phenomenal—I haven't heard any signals off the back as yet. My conservative guess would be 25 dB. Front-to-side ratio is probably about 25 dB or more, as signals off the sides are practically nulled out.

You can build your own easily and cheaply in a short time. I think you'll be pleasantly surprised. Naturally, if you don't have trees for end supports, you can use your house, a tower, a couple of zoom-up masts, or whatever you find handy. Ready to raise, the antenna weighs less than five pounds, and doesn't require a major support.

Jim Gray W1XU can be contacted at 210 East Chateau Circle, Payson AZ 85541.

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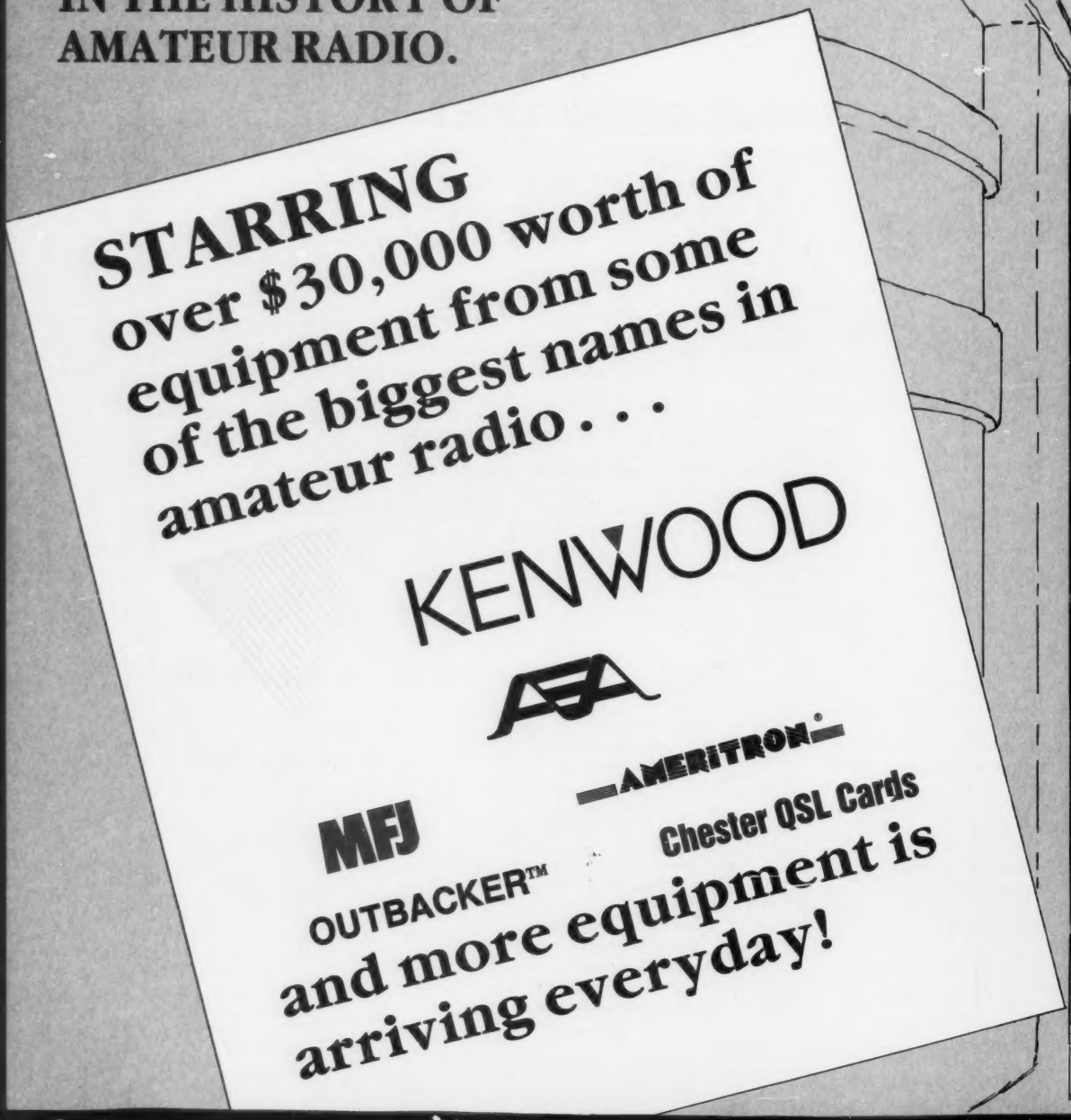

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A Visual CW Offset Indicator

Add the feature the manufacturers forgot.

by F.A. Bartlett W6OWP

Before transceivers became "state of the art" and the receiver and transmitter were separate entities, zero-beating a CW transmitter to the station called or worked was a simple matter: Briefly switch on the VFO, and zero in on the incoming signal. When transceivers appeared on the scene, difficulties arose. In early designs, tuning for an acceptable beat moved the transmitter frequency so the two stations ended up a beat note apart.

Modifications followed. First, a fixed CW offset of 600–800 Hz was provided. When a signal was tuned in, the transmitted frequency would be somewhere near that of the station being received. Next, to make the setting more accurate, a sidetone monitor producing a tone exactly equal to the amount of offset appeared in most transceivers. By matching the incoming signal to the sidetone, transmitting frequency would be the same as the received frequency. But theory and practice are sometimes at odds. Procedure for matching the two tones is awkward and time consuming. Instruction manuals haven't helped—often being vague in describing the procedure or omitting it entirely from paragraphs on CW operation. Perhaps some "state of the art" updating is in order.

This article describes an easy-to-build unit that provides a visual indication at signal and sidetone match. The indicator, built around an LM567 tone decoder IC, operates full-time; you don't have to push a button. Just tune in the signal and watch the indicator's LED. Rusty Darting KB6EME suggested this application of the LM567, based on an indicator built for his Kenwood 430.

The LM567 is an 8-pin, phase-locked loop IC; a lock between its internal Voltage Controlled Oscillator (VCO) and the applied signal brings its output pin low. Adapted to indicate CW offset, the VCO is set to the offset frequency. In most transceivers, this is the sidetone frequency. Received audio is monitored, and when the beat note matches the VCO, an LED turns on.

A Small Package

Figure 1 shows the schematic diagram. Circuit values are optimized for the 600–800 Hz range. Operating voltage is zener-regulated at 6.2 volts, taken from either a 13.8 or 8-9 volt source. Power may be available from an accessory port on many transceivers. Audio is taken from the speaker or headphone output. There is no insertion loss. Current consumption is 14–16 mA.

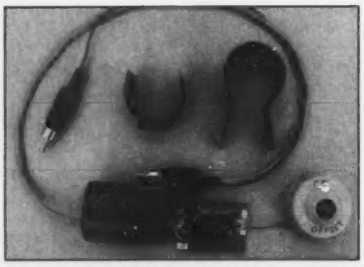

Photo A. The CW Offset Indicator, ready for installation. A 35mm film container makes an ideal housing.

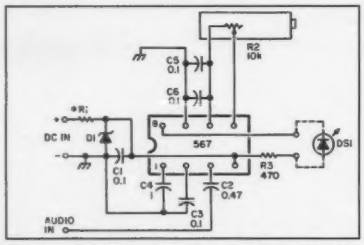

Figure 1. Schematic of the CW Offset Tuning Indicator.

The whole assembly requires a very small board. Although you could fit it into almost any transceiver, drilling the front panel to mount the LED is something few owners would care to undertake. As a practical alternative, a "recycled" 35mm film container proved to be an ideal housing for an add-on unit. See the component assembly in Photo A.

A printed circuit pattern is shown in Fig. 2. However, assembly is simple enough for wired construction on perfboard or a Radio Shack #276-150 board cut to size. Dimensions are 1-1/2"L x 1-5/32" wide to fit the film container. Two 5/16" holes are drilled in the latter, one in the end for connecting leads and the other in the cap for the LED. These holes are fitted with 5/16" grommets. A standard LED fits this size grommet, making a holder unnecessary. The IC is mounted with an 8-pin socket. Before assembly, R2, the VCO tuning control, is set to mid-range. Except for the LM567, all electronic components are listed Radio Shack items. The 567, a common IC, should not be difficult to find.

Two types of mounting clips are shown in Photo A. Each is made from a thin metal strip 1" wide, the circular portion of which is formed around 1" diameter tubing. To attach it to a heat sink, fit it between the fins and press lightly. If the transceiver has a steel cover, a magnet mount is a practical choice. The clip is formed with a flat base to which a small circular magnet is epoxied.

Adjusting R2

A one-time adjustment of the VCO tuning control R2 is required. The VCO must be accurately set to the transceiver offset. Most transceivers manufactured the past two decades have related offset to the sidetone frequency. With the sidetone activated, R2 is adjusted for maximum LED indication at the lowest level that provides response.

Some transceivers provide adjustable sidetone, others a BFO or Pitch control. If reference to the instruction manual shows settings that equate sidetone to the CW offset, the procedure is the same as in the preceding paragraph.

If the sidetone frequency is in doubt, and the digital readout displays both receive and transmit frequencies, the CW offset will be the difference in readings taken when the RIT or other beat note control is turned off or at zero setting. If only the receive frequency is displayed, the specified offset may be used in conjunction with a marker check point to reach a close approximation of the frequency to which the VCO should be set. With the selected marker carefully tuned to zero beat, the stated CW offset is subtracted from this reading and the resultant frequency tuned in. The beat produced is used to set the VCO. For example, if the marker reads 3600.00 and the specified offset is 800 Hz, you would tune to 3599.20 kHz.

Operating Notes

In using the CW Offset Indicator, the beat note control (RIT, Clarifier, Pitch Control, etc.) must be turned off or at zero setting, the same as normally prescribed for initial tuning. Once the signal is centered within the LED response, use the auxiliary control to choose your preferred beat note—or, if you're using a computer interface, to provide correct frequency.

If you've worked with the LM567 IC, you may question the wide range of levels pre-

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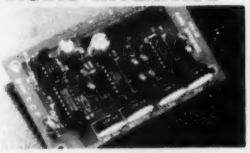

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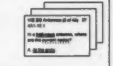

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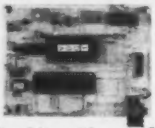

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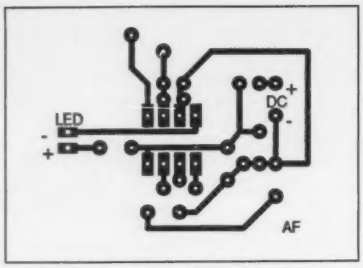

Figure. 2 Actual size foil pattern.

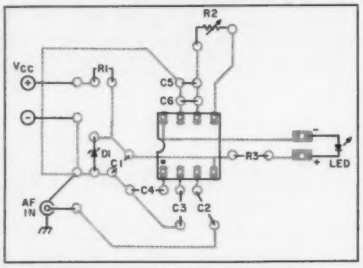

Figure. 3 Parts placement (top view).

sented to the decoder input. Recognizing that a broadening of response may occur at higher levels, I tried a number of input conditioning arrangements. I found that the added complexity coupled with more critical tuning negated any advantage.

Two factors are involved here. First is the increase in acquisition time for "lock" as the difference between signal and VCO frequencies widens. Since the incoming signal is keying, valid indication occurs at a closer frequency match than if a steady tone were tuned in. Secondly, input conditioning free from harmonic responses moves the indicator out of the simple add-on category. But once you're familiar with the unit, typical accuracy is on the order of 60 Hz. Tuning at reduced volume can bring this figure down to 10 Hz or less. 73

F.A. Bartlett W6OWP, 6306 Tabernacle Lane, Paradise CA 95969.

Parts List

C1, C3, C5, C6	RS# 272-1432
C2	RS# 272-1433
C4	RS# 272-1434
D1	6.2V zener, 1W, RS# 276-561
DS1	T1-3/4 yellow LED, RS# 276-021
DIP socket	8-pin, RS# 276-1995
R2	RS# 271-343
R3	RS# 271-1317

Notes

R1 is 470 ohms, ¼W for a 13.6 supply source, RS# 271-1317. For an 8–9V source, use 180 ohms, RS# 271-014.

All capacitors are 35V tantalums. C5 and C6 are paralleled because Radio Shack doesn't stock 0.2 µF tantalum.

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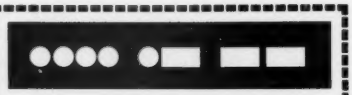

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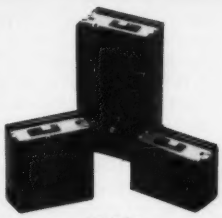

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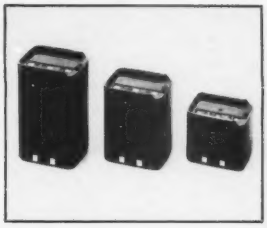

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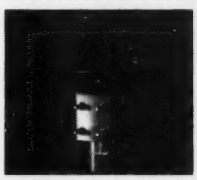

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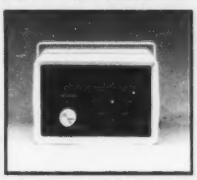

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QSLing Practices: The Dark Side

Aside from the exhilarating thrill of making a contact with a new and rare country, receiving a coveted QSL card is often the high point of the contact. Many DXers want to receive their QSL from the "new one" tomorrow, or even next week, but immediate receipt of QSLs is usually the exception rather than the norm.

Why can't we get our QSL cards within a "reasonable period of time"? For several reasons. First, the definition of "reasonable period of time" is a relative measurement. "Reasonable" from a QSL manager's viewpoint takes on an entirely different meaning when filling out thousands of QSL cards rather than one or two. Second, we must remember that amateur radio is a hobby and QSL managers must work for a living—they cannot spend every waking moment filling out QSL cards.

Please understand that the waiting time for a QSL from an established DX operator or QSL manager is normally considerably shorter than the wait for a card from a DXpedition. An established DX operator or QSL manager already has the QSL cards on hand and does not usually receive hundreds of cards each day. There are numerous delays built into DXpedition QSLing: travel time from the DXpedition QTH to the home QTH, time required to design a QSL, time required to print fancy QSL cards (good quality color photo QSL cards often require a minimum of six to eight weeks processing time), etc., etc. The majority of DXpeditions QSL as soon as reasonably possible. A few don't, but they are definitely a minority.

Sometimes DXers themselves help cause QSLing delays. If you wait several weeks or months before mailing your QSL card, then obviously your QSL request will go to the bottom of a huge pile of other requests. The size of the pile, the accuracy of your request and the efficiency of the QSL manager then determines when you receive your QSL. Other common reasons for QSLs being delayed include: the wrong date or time on the QSL card, multiple QSLs for different bands in one envelope (especially if the QSL manager has a helper for each band, if each band was recorded in separate logs, or if one of the QSOs is "not in the log"), no self-addressed envelope, no return postage (or IRCs, green stamp, etc.), or the QSL was sent to the wrong person or address. And, mail does get lost, both enroute to a QSL manager and in return.

If you follow a few basic rules QSLing should not be painful and delays should be minimized. Fill out the QSL accurately using UTC time and date. Always provide a self-addressed (SAE) or self-addressed and stamped (SASE) envelope with your QSL. Always provide sufficient return postage. As a general rule, it is best to omit any mention of callsigns or amateur radio on the envelope. IRCs and green stamps should be hidden inside the envelope to prevent theft. Use an outside envelope that is large enough to accommodate an *unfolded* SAE inside. Do not use fancy commemorative postage stamps.

If all of your friends who QSLed around the same time you did have received their cards and you have not, THEN it is time to re-QSL, not before.

QSLing, Proposed Standards

QSLing is one of the most discussed subjects in DX publications, on the air, and wherever DXers gather. Because of this, several organizations have proposed QSLing standards that sound great in theory, but have little chance of actually controlling QSL managers. Let's face the facts—this is a hobby and there is no realistic method of enforcing rules for QSL managers. However, the proposals from two IARU-affiliated European societies are worth studying.

Code of Practice for QSL Management from the RSGB (United Kingdom)

1. Any DX station appointing a QSL manager must ensure that satisfactory arrangements are in place for receiving and responding to the bureau as well as direct cards. Adequate publicity must be given to such arrangements.
2. QSL managers must respond to incoming SWL cards.
3. Any DX station appointing a QSL manager must accept responsibility for that manager's performance.
4. QSL managers must respond "direct" and within a reasonable period of time as long as sufficient funds/IRCs/stamps to cover the exact cost of return postage (and a return envelope if one is not supplied) are enclosed with the request. Air mail must be used if sufficient funds/IRCs/stamps are enclosed.
5. QSL managers must not insist on separate envelopes/applications for different QSOs or different stations. They must establish internal procedures to handle such multiple requests.
6. Recognizing that mistakes of time and/or date are frequently made, QSL managers must make a reasonably diligent search for QSOs that cannot immediately be found in the log.
7. In particular: It is unacceptable to demand a specific number of IRCs or "green stamps" if a smaller number would cover the cost mentioned in point four. It is unacceptable to return cards via the bureau if they were received direct with sufficient funds/IRCs/stamps as defined in point four.
8. There should be no time limit for applying for QSL cards. Old logbooks should be passed to responsible DX clubs when the manager no longer wishes to retain them.

QSL Manager's Code—REF (France)

Considering:

That the great demand for cards from rare countries has given rise to the institution of QSL Manager, a corps of radio amateurs who volunteer to act as QSL administrator on behalf of amateurs located in sought-after countries;

That tribute should be paid to the performance of these QSL managers, who during many years spend their energy and their spare time in the service of radio amateurism, without any return;

That, however, in a few regretful cases, the radio amateurs find themselves confronted with a QSL manager whose operation is not up to par;

That experience has shown that a malfunctioning QSL manager can create worldwide discontent and commotion;

That, although QSL managers act as individuals, not commissioned by a member society or IARU itself, their activity is closely linked to the smooth functioning of the known awards of world reputation;

That the IARU and its member societies have set up and operate a worldwide QSL Bureau organization through which pass practically all the worldwide issued QSL cards, including those destined for the attention of the above mentioned sought-after cards;

That many or most QSL managers make use of the IARU QSL Bureau organization (incoming, outgoing, or both);

That the incidents that have taken place justify a reflection on IARU level whether measures are called for so as to avoid incidents in the future;

Proposes:

In the first instance, to draw up a "QSL Manager's Code" which could be widely published in the amateur press and therefore become widely known and accepted by the DX fraternity as the standard of good behavior;

Suggests:

That such a QSL Manager's Code also constitutes a tool which can be used by the award issuing member society or any other body in case difficulties arise in the normal forwarding of cards destined to obtain their awards (for example by having the Code signed by the manager);

Furthermore Suggests:

That such a QSL Manager's Code could stipulate among other clauses the following points:

The QSL manager is a volunteer who puts his effort to the service of his fellow radio amateurs, without any return, retribution or advantage of any kind;

The QSL manager aims at forwarding the cards entrusted to him by his mandator within a reasonable time span and at the lowest cost possible;

The QSL manager fills out his mandator's cards in accordance with his mandator's log sheets;

The QSL manager who uses direct mailing accepts the reimbursement of the mailing cost by means of the number of IRCs as prescribed by his local post office. He will not accept any payment in money;

The QSL manager, for cards to be sent within his own postal territory, accepts the stamps valid for use in that territory;

The QSL manager refrains from criticizing the layout or contents of the cards destined to his mandator;

The QSL manager who uses the services of the QSL Bureau within his country acts in conformity with the latter's instruction.

These are the proposals. Put yourself in the position of a QSL manager, who has thousands of QSL requests piling up, many of them violating many of the basic rules of QSLing. Are these proposed standards realistic?

South Georgia and the South Sandwich Islands

As this column is begin written in July, Tony WA4JQS, organizer of the South Georgia-South Sandwich Islands DXpedition, says planning is continuing. The operators will meet the ship *Indiana* at Puntas Arenas, Chile, on November 14. The ship will then proceed to Port Stanley, Falkland Islands, to pick up generators and other items (November 17). The callsigns to be used for the two separate operations are VP8SGI and VP8SSI. The beginning dates for the operations are around November 22 for VP8SGI and November 26 for VP8SSI. The total cost of the transportation is reported to be $140,000. A large sum of money is still needed (donations via AA6BB/7) to help make the down payments for the transportation. 73

Continued from p. 30

ception, over 50 WPM, but is more susceptible to noise. The HI setting is most effective in reducing the effects of noise but will also attenuate code transmission over 35 wpm. To change the Filter setting, press *F* followed by the "+" or "-" key to increase or decrease the value.

The *R* key restores the above parameters to their "nominal" values.

The main screen is divided into two sections: copy and scratch pad. The copy area continuously displays the incoming code. In the scratch pad area, enabled and disabled by pressing the space bar, you can capture those parts of the incoming message that you want to keep for reference. You can clear the copy area by typing a *C*, and the scratch pad by typing an *S*.

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Where to Get ROBO-COPY

Send $5.00 (for postage and handling) along with a FORMATTED floppy, either 5¼" or 3½", and a rigid, self-addressed disk mailer to: Mike Hansen/WB9DYI, 1405 Tanglewood Drive, Algonquin IL 60102. ROBO-COPY is not copy-protected and may be copied and distributed freely for private use only. Save multiple postage and handling fees by copying the software for friends and club members. *[Ed. Note: The ROBO-COPY program (ROBO.EXE), a detailed description of the CW receive algorithm (ROBO.TXT) and the 'C' source code listing (ROBO.C) are all available free on the 73 BBS under the 73mag SIG. The BBS number is (603) 525–4438.]*

My thanks to Bruce Brazelton W8MHW for his assistance in reviewing this article. 73

Michael C. Hansen WB9DYI, 1405 Tanglewood Drive, Algonquin IL 60102.

Parts List

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C1	0.047 µF @50V, Mylar™
R1	4.7k, ½W
Q1,Q2	2N3906 or equivalent
D1	1N914 or equivalent
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R2	470Ω, ½W
C2	4.7 µF @10V
T1	110V to 12.6V @300 mA, RS #273-1385A
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C3,C4,C5	0.01 µF @50V, ceramic

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Radio direction finding (RDF) enthusiasts are always looking for new challenges. The latest in the Los Angeles area is UHF. A competitive transmitter hunt on the 440 MHz FM band starts at 2 p.m. on the first Sunday of each month, with boundaries that include parts of four counties—over 2300 square miles total.

T-hunting on 440 isn't completely new. Ham TV enthusiasts have done it in the past. If you have only hunted below 150 MHz, you're in for a real surprise on your first 440 MHz hunt. It seems as if every object in the universe reflects 440 MHz signals. UHF waves bounce like a million ping-pong balls. Unlike HF signals, which propagate by ground wave or ionospheric refraction, UHF signals carom around, scattering off buildings, hills, cars, overpasses, canyon walls—you name it.

On the most recent hunt, almost all the teams drove north from the starting point and spent the afternoon scouring several foothill cities 13 miles north, following bounces. The transmitter was actually 17 miles southwest of the start point, but the signal could not be heard from that direction at the start, due to shielding by intervening hills. The signal went up Brea Canyon, around the starting hill, and "lit up" all the northern mountains.

If you think you're an unbeatable foxhunter, try 450 MHz for a humbling experience. Now, let's see who will be the first to set up a hunt on the 1.2 GHz band!

Triangulation by Packet

Several local hams have begun to hold QSOs from their base stations during the Saturday night mobile 2 meter hunts. They exchange their bearings on the fox via packet radio, in an attempt to figure out where the hider is without going out on the road. Last hunt, their collective guess was within two miles of the actual hiding spot. Not bad—I wonder which mobile hunter will be the first to put a packet terminal in his hunt vehicle to eavesdrop on these folks.

A large fraction of the southern California T-hunters are active on packet. Tom Ritchie N6FBH saw this as an opportunity. He has set up the first dedicated T-hunt packet bulletin board system (PBBS). If you connect to N6FBH-1 on 145.05 MHz, you can exchange messages with other T-hunters, read the results of recent hunts, and download schedules and rules for the dozen or so hunts in the upcoming month.

Because Tom's board is limited to T-hunting activities, it is not in the Westnet mail system. If you want to send him a packet message and can't get into his PBBS direct via a digipeater, send it to N6FBH @ WB6YMH-2.#SOCAL.CA.USA.NA. If your message is of interest to all hunters, I'm sure he will move it from YMH to his PBBS. By the way, you can also send packet messages to me at WB6YMH-2.

Be a Life Saver

Words can't describe the excitement of being the first foxhunter to find the hidden transmitter and win the hunt. If you have tried your hand at it, you are probably nodding in agreement. But did you know there could be an even greater T-hunting thrill awaiting you? Your skill and your gear could save a life!

Most hams have heard of Emergency Locator Transmitters (ELTs). These 100 milliwatt units (see Photo A) activate on impact when an aircraft goes down, giving the survivors a chance to be located and rescued before being overcome by their injuries or by exposure to the elements. In a soft emergency landing, victims can activate the ELT manually.

When an ELT comes on the air, someone with RDF expertise has to find it right away. Responsibility varies from area to area. Civil Air Patrol (CAP) volunteers take on the task in many parts of the country.

Veteran CAP member Jerry Wellman works for two Utah newspapers by day, and uses RDF to save lives in his off hours. He has been involved in search and rescue (SAR) for 20 years. Many CAP members are hams; this led Jerry to get his own license (WB7ULH) ten years ago, and add Amateur Radio Emergency Service (ARES) to his activities.

"Some time back, a guy crashed into one of our canyons in bad weather," Wellman recalls. "He sort of pancaked it in. We picked up the ELT and did a classic response, with the sheriff, the CAP, some hams, and a plane. It went right together. One guy was killed in the crash, but the other survived. We had an Army chopper come in and got him out. Another three hours and he would have died in the snowstorm." This is the typical scenario of a Utah CAP SAR mission—a light plane going down in rugged mountain terrain. If the crash site is high, the ELT signal may be heard at an airport or at some of the VHF/UHF ham and CAP repeaters that are equipped with auxiliary 121.5 MHz distress frequency receivers and alerting circuits.

If, as often happens, the plane ends up in a deep canyon, the ELT signal is usually reported first by a passing commercial flight. Airline pilots are urged to monitor 121.5 MHz at all times for this reason.

The ELT signal may also be picked up by one of the search and rescue satellites (SARSATs). ELT signals picked up by these low altitude US, French, and Canadian birds are processed at Scott Air Force Base in Illinois. (Soviet COSPAS satellites are also part of the system.)

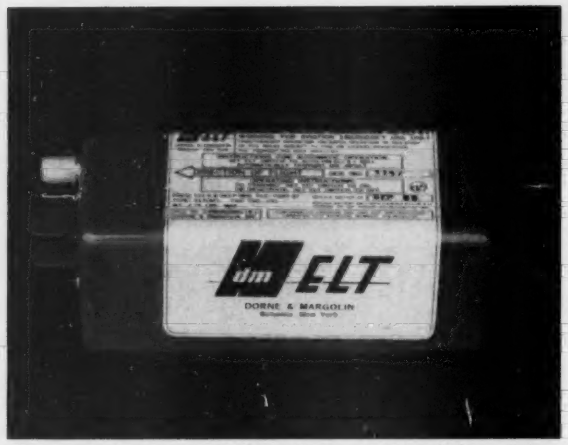


Photo A. This Emergency Locator Transmitter mounts in the tail of a small plane, and activates on impact. (Photo by WB6UZZ)

The SARSAT center computers perform a special kind of Doppler RDF. It is not the same scheme used by mobile Doppler units with ring antennas. Instead, SARSAT uses the Doppler frequency shift observed on the ELT signal by the satellite due to its rapid velocity as it passes overhead.

Data from a single satellite pass over an ELT normally locates the site within 25 miles. Computations from multiple passes can improve the "fix" down to a fraction of a mile.

Pilot's Choice: Dual Antennas

If weather permits, RDF-equipped CAP aircraft lead the search mission. Airborne RDF antennas must be stationary and not add appreciable windload to the plane. No rotating yagis or quads here! Dual antenna switched-pattern sets such as the L-Per by L-Tronics are the overwhelming choice. Their ruggedness and simplicity make them useful on a plane or as a hand-carried unit in the wilderness. "We even used one successfully on a helicopter," Wellman says.

As with other RDF efforts, experience and training have no substitutes. Sure, an inexperienced RDFer can tape a couple of antennas to a plane's windshield and go on a search. But planes with permanently mounted antennas and experienced pilots almost always do better. Every aircraft is different, and the middle of a SAR mission is not the time to be learning the eccentricities of a new airborne RDF lashup for the first time.

CAP constantly emphasizes the importance of practicing RDF skills in advance of need. "Most pilots," says Wellman, "need continuous training in RDF to be effective. For a while, we were having drills where we'd ask someone to take an ELT and hike into the mountains and hide it on 121.6 MHz for practice. They did some interesting things to test us: unusual antenna positions, putting the ELT inside a steel barrel, and multiple ELTs." The best volunteers take advantage of every opportunity to get out in the field, either on training runs or actual missions. "Whoever is going," says WB7ULH, "I'll go with 'em."

The biggest problem with the ELT system is false alarms. SAR people have learned to check nearby airports first when an ELT alarm is heard. In an overwhelming majority of cases, the signal turns out to be an accidental actuation caused by a hard landing or other non-emergency. One estimate places the cost of tracking down these false alarms at two million dollars per year.

Wellman tells the story of one bad Utah windstorm. "It set off two or three ELTs, and a pilot crashed into the mountain at the same time.

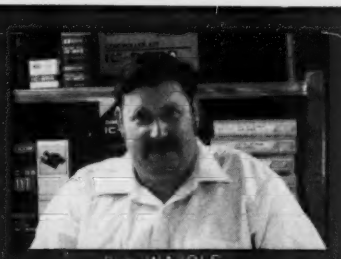
"We were DFing all the false alarms, but as we turned them off, we could still hear an ELT signal. It turned out there was a guy alive on top of a peak at about 9700 feet. A couple of days later he was found; it took that long to get to him. The para-rescue people from Hill Air Force Base jumped into the site. He was critical, with probably only a couple of hours left."

Get Involved

If you would like to use your T-hunting skills for a valuable public service, contact your local office of the CAP.

It isn't hard to think of other situations where RDF could be a lifesaver. How about finding endangered hikers? Anyone lost or injured in the wilderness who carries a beacon transmitter will be much easier to locate.

We hams always carry our HTs when we're out in the woods, right? But what about everyone else? The FCC has proposed a new public radio/RDF service, called Personal Emergency Locator Transmitter Service (PELTS), at the suggestion of a ham in Oregon. Already it is embroiled in controversy. Come back next time for a careful look at this proposal. 73



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Go Fly a Kite!

Last year I gave an ATV demo at the Findlay (Ohio) Radio Club. After the presentation, Jon WM8W approached me and said "Why don't you take your ATV system and go fly a kite!" This was not meant as an insult—Jon had been planning to build a monster kite for some time and thought it'd be great to fly a TV camera for some great aerial views.

Jon paid a visit to a store that specializes in kites of all sizes (*On the Wind, Heritage Square, Grand Rapids OH 43522; (419) 832-KITE*). Pam Sherwood, the owner, recommended a large delta wing design for the best combination of stability and lift capability. She let him borrow a big 12-footer for the first attempt. Jon mounted a 2-pound payload consisting of a video ID and 80 milliwatt ATV exciter on the string about 50 feet below the kite. The first flight took the payload up to 500 feet, resulting in good reception out to 20 miles and sync bars out to 60 miles. The need for a bigger, reinforced kite became evident when a wind gust broke the main spar! The kite and payload fluttered back to the ground heading directly for the railroad tracks. The train whistle confirmed his worst fears. The kite was on a collision course with the 5 p.m. Baltimore and Ohio freight express!

Photo A. The monster kite in flight. (Photo courtesy of Mike Dawson.)

Jon figured they would probably charge him fare, so he reeled in the line as fast as he could, narrowly missing the train. This episode convinced him he needed a much larger kite, capable of lifting at least four pounds. Raw materials were gathered up from the kite store to put together a massive 16-foot delta wing. (Jon's new kite was mentioned briefly in the February 1990 "ATV" column.)

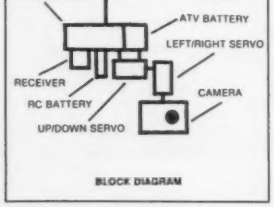

Figure 1. ATV payload configuration.

Photo B. The ATV payload ready for lift-off. (Photo by Jennifer Pifer.)

The Live Camera Kite

After a summer of experimentation, he sent us construction details for his ATV kite with a radio-controlled TV camera. Through use of a two-channel R/C system, he now has control of both the azimuth and elevation of the camera for some spectacular aerial views from as high as 800 feet.

The latest system consists of a Uniden B/W camera, 1 watt P.C. Electronics ATV transmitter, two-channel R/C receiver and servos, a 1 pound gel cell battery and a little wheel antenna (see Figure 1). The "Little Wheel" worked well in the flight tests and is a very lightweight omni-horizontal antenna. It was obtained from *Olde Antenna Lab, 4725 W. Quincy #1014, Denver CO 80236*.

Eric Vermillion, one of the local R/C enthusiasts, fabricated a camera mount out of nylon for the two servos such that one servo is attached directly to the other (Photo C). This provides a very lightweight method of independent Az-El control of the TV camera. The azimuth control has better than 90 degrees of movement, while the elevation servo allows you to view the horizon or to pan smoothly down to point at the crowd directly below the kite. (Whenever you fly a kite this size there usually is a crowd!) The little wheel antenna is mounted on three 12" long plastic or nylon rods to help keep RF out of the camera and the R/C receiver. Using a 1.2 Ah lead acid battery, the payload operates for about 45 minutes.

For best stability, attach four strings about two feet long to the corners of the payload. Tie two of these strings together at each end of the payload. This forms your mounting harness to the flight line. Make two loops about three feet apart in the kite's flight line about 50 feet below the kite itself. Attach each pair of payload mounting strings to these loops. This provides a very stable mount, although you sometimes may experience a gentle swinging motion depending on wind conditions.

Roll Your Own

You can construct your very own monster delta wing kite using the dimensions shown in Figure 2 (The heavy black lines are the support spars). Choose the design width (example: 16 feet). This is your 200% value. This will make the height of your kite exactly eight feet (100% scale). All other dimensions are scaled from this value. It's a good idea to make a paper version of the kite just to be sure of your calculations. The actual kite is constructed from 1.5-ounce nylon material. Allow enough overlap (3") on the edges of the kite and the centerline to make sleeves for the spar supports. The ½" diameter spars are made out of a high strength carbon fiber. They are lightweight and hollow, but can really take a lot of heavy lifting and abuse. The spars can be purchased at kite stores and come in 55" lengths. It will probably be necessary to connect two sections together with a ferrule to achieve the proper size spar. It's a good idea to double stitch those areas of highest stress, such as the horizontal back spar attachment points. The mounting hole on the keel consists of three nylon layers stitched together to provide additional support for flight line attachment. The horizontal spar mounts in pockets sewed into the back of the kite and helps to form the kite into the proper airfoil shape. All materials are available from stores that specialize in larger kites. While at the kite store, it's a good ideas to take a close look at a commercially built delta wing kite before building yours.

Photo C. Close-up view of the servo operated Az/El camera mount.

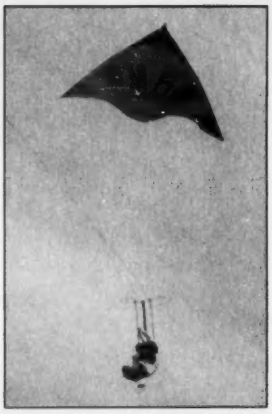

Photo D. The ATV package heads for the skies.

Flight Tips

It's best to use 220-pound kite string. The forces on this large a surface area can be quite strong in a moderate wind. It sometimes takes three people just to bring the thing back in!

A good source of information about kite flying (as well as listings for kite store locations nationwide) is available from a magazine called *American Kite*. They can be reached at *American Kite Company, 480 Clementina St., San Francisco, CA 94103; (415) 896-0830*.

Jon plans to add a 100 milliwatt 10 meter beacon on 28.235 MHz which will be mounted directly on the kite itself. The 10 meter inverted-V antenna will fit nicely inside of the spars. The beacon will be operational during each flight and should prove to be an interesting experiment.

The ATV kite has been a big hit at hamfests and other special happenings. Not only is it a crowd stopper, it's an inexpensive way to provide a bird's-eye view of any event. For more detailed information on the kite system, you may send an SASE to Jon Pifer WM8W, P.O. Box 574, Arlington OH 45814. 73

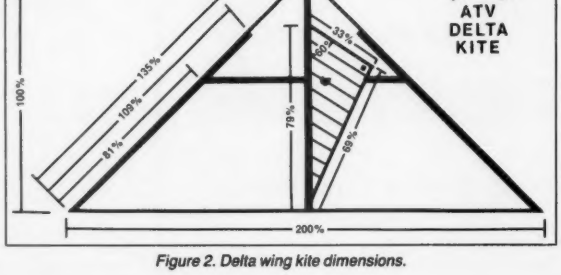

Figure 2. Delta wing kite dimensions.

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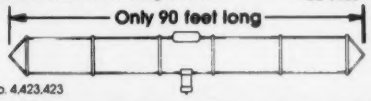

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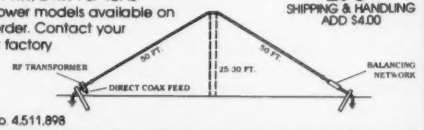

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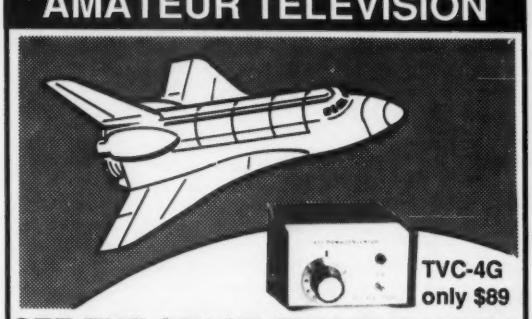

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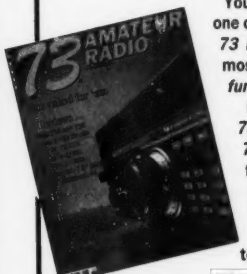

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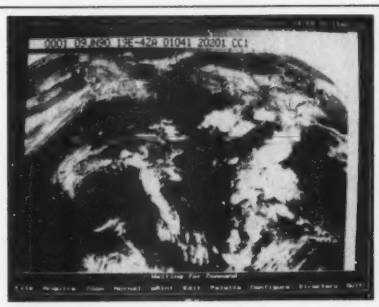

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Smarts, Hearts and Sparkle

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The instructor of an after-school ham radio club or a teacher lucky enough to be teaching ham radio in a school, as I do, must take responsibility for making sure that the children in his/her class are highly motivated to learn, and that they feel good about what's happening in that class. Having been on the front lines for over nine years with sixth, seventh and eighth graders in a New York City school, I have come to the conclusion that there are three ingredients which determine whether or not a course will be successful. The three components that teachers must concern themselves with are "smarts, hearts and sparkle."

Smarts

The first ingredient needed for a vital and dynamic ham radio class is "smarts." This refers to the educational validity of the course. Amateur radio in a classroom gives the teacher the opportunity to incorporate all areas of a school's curricula into the daily lessons. While most students are suffering through science, muddling through math and laboring over language arts, children in the amateur radio class are eager and excited about pointing out countries on a map while speaking to a citizen from that country at the same time. The students will be using math skills because of distances, time differences and formulae that are an integral part of radio work. To youngsters in an amateur radio class, this is not just "yucky" schoolwork, it's what we have to do to better enjoy our time on the air.

The teacher of amateur radio must have a flexible approach. You never know who will be getting back to you on the radio. The teacher must be willing to extract the most and the best out of whatever happens. There are built-in social studies and language arts lessons in every contact. It's a bonus if there's a really interesting ham at the other end, and a real treat if it's a live current events happening, like a hurricane or an earthquake, or a contact with an astronaut in space. All the children should leave the classroom ham shack having had new experiences, having learned new skills appropriate to their abilities, and having enjoyed the whole process at the same time. The "smarts" part of a ham radio curriculum is the ability to present material capable of exciting the more "reluctant learners" as well as challenging the "gifted" student.

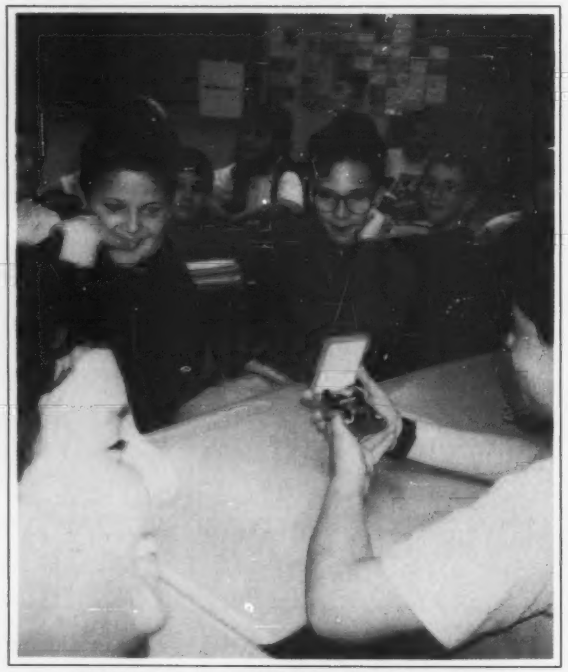

Photo A. Students having fun trying to "decode" a message.

Photo B. Carole WB2MGP pointing to the flag of a country where the class has made a contact.

Hearts

The "hearts" component of my magic formula is where the children become motivated to do well because they are made to feel special. Many youngsters in today's society derive almost all of their security and nurturing from their school environment. The "hearts" factor is very important to children with little or no self-esteem, who have really never succeeded at anything else in their school careers. In the ham radio class there is a myriad of skills and abilities a teacher can use to encourage all the youngsters to participate and to contribute on their own levels. Every child should leave that room feeling good about himself. Today's children don't care what we know—they want to know that we care.

Sparkle

"Sparkle" is my favorite ingredient. That's where the instructor makes all the difference in the program. "Sparkle" is that extra-special something that only a creative, dynamic and enthusiastic teacher can bring to a program. It's the smiling face, the accepting tone of voice, the encouragement given, and the establishing of an environment that children want to be a part of while they are learning and having fun.

The combination of a well-trained and enthusiastic teacher of amateur radio, coupled with a supportive administration at school, can only spell success for everyone in the program. The message on this page from my principal, Stanley Katzman, is meant to be encouraging and supportive to all teachers and administrators considering an amateur radio program this year. You can use this column to ask for any help or assistance you may need. Go for it!

As we begin another school year, thoughts of invigorating our curriculum offerings come to the foreground. We are constantly in search of ways in which to infuse enthusiasm, positive attitudes and knowledge to benefit the children in our schools.

From all of those points of view, and many more, the ham radio program at our school fills the bill. Youngsters are literally given "hands-on" experience in communication with remote and varied parts of our continent. They have an opportunity to recognize the universality of concerns over environment, political unrest and ecology. They learn to express themselves succinctly, and with knowledge, so they can better communicate with the voices at the other end of the line. They recognize that we are indeed part of a very small, yet extremely diverse, global community, each of us with similar needs but with varying local problems.

Ham radio, in the hands of a master teacher, incorporates not only the technical skills necessary to operate the apparatus, but also raises the youngsters' awareness and sensitivity to their environment. As school administrators, the task of familiarizing our charges with the basic elements of education is but a small part of our mission. Through this program, the youngsters exposed to the world of ham radio get to recognize the true meaning of cooperation and fellowship. They recognize that there are people, identified only by call numbers, who are willing and ready to help when the need is there, regardless of the miles that separate us.

That is a powerful lesson for young people to learn and, I am pleased to say, one that the students of the Rocco Laurie Intermediate School have been exposed to for many years. Our master teacher, Carole Perry, stresses those elements and continues to bring the message of cooperation and caring to her pupils.

The money and energies expended on creating, nurturing and maintaining a ham radio program pay untold dividends in the development of a student body who is aware and willing to work with people all over the world in bettering the lives of all of us.

Stanley Katzman, Principal
The Rocco Laurie
Intermediate School 72, R.
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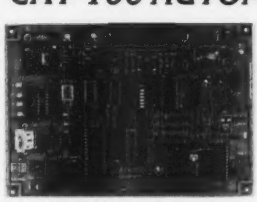

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ASK KABOOM

The Tech Answer Man

Michael J. Geier KB1UM
% 73 Magazine
WGE Center
Forest Road
Hancock NH 03449

A Fork in the Road, and More Blindfolded Painting

Before we begin, I'd like to ask a favor. Please don't call me at home. I have received calls regarding columns and construction projects at all hours of the day and night. Often, long-distance callers leave their numbers on my answering machine and expect a return call. I'd love to answer each one, but I just can't afford it. Could you? If you need to reach me, the best way is via *73*. They will forward all correspondence. Letters of interest to other readers will get mentioned here in the column, but I can't write personal letters back—there's just too much mail. Thanks for your understanding.

Speaking of interesting letters, I just got one today from a young gentleman named Bob in California. No call, last name or return address. He says that he is 18 years old and would like to become an "electronics repairman." His electronics teacher, however, told him that there is no demand for repair people because surface-mount chips have made it too difficult to change parts. The teacher went on to suggest that the students become engineers instead, as the need is much greater for designers. Bob would like to know if this is good advice.

Well, Bob, let me state up front tha. there is and probably *always* will be plenty of demand for good technicians (the industry term for "repair people"). Remember that for every one designer who creates a product, many repair people will be required to keep the thousands or millions of them working. Yes, surface-mount parts are harder to change, but somebody has to do it. Further, not everything makes use of them. Mostly, they are found in miniaturized gear, such as camcorders, VHF/UHF walkie talkies, portable CD players, etc. The average home VCR doesn't use them, or has only one or two. The same is true for many of the other household gadgets we all take for granted. Of course, that may not always be the case; surface-mount parts will surely be used more and more in years to come. But why be afraid of surface mount? With the right soldering tools, it's really no big deal. And, obviously, no one is going to throw a $1000 camcorder away because a surface-mount chip goes bad, so they must be getting changed, right?

The question of which road to choose goes much deeper. Engineers and technicians do very different things. Engineering concentrates on the theoretical. It involves lots of math and physics. In my experience, most new engineering school grads have hardly touched a transistor or IC. They know lots about Fourier transforms and network analysis, which is very useful stuff. But they have little idea how to use real parts. I guess schools expect them to learn the practical side on the job, and some certainly do. But, as a general rule, engineers spend much more time with a calculator than with a soldering iron, and precious few could fix their own VCR. By the way, engineering pays considerably better than does technician work.

Technicians, on the other hand, are expected to know real circuits very well, but often fall short on the amount of theory they really need to do the job properly. I've met some who barely knew Ohm's law! Others didn't know how to use an oscilloscope, or had little concept of the relationship between the time and frequency domains. Anyway, in the long run it all boils down to this: Do what you enjoy! If you love getting your hands in circuits and, especially, if you really enjoy the thrill of the troubleshooting "hunt," become a technician. If, on the other hand, you get pleasure from mathematics and enjoy devising solutions to new problems, go for the engineering. And remember, you can always do a bit of both. The really good techs are practically engineers, and vice versa. One last piece of advice: Get a ham license. The stuff you'll learn will serve you well no matter which road you choose.

I also got a postcard from Paul W9HD, in which he admonished me to "keep up with the times, OM," because I had wondered whether anybody had put a FAX machine on the air. He explains that the PK-232 does both WEFAX and "ham FAX" real well. Gimme a break, Paul. Even I know there's plenty of computer-type FAX available for the ham bands. I was referring to normal "stick a document in at one end and out pops a copy at the other" office-type FAX. As it turns out, that's been done too. Anyway, Paul, thanks for writing.

Fixing It Without a Schematic

Now, on to our topic. Last month, we were discussing the fine art of schematic-less repair. I use the word "art" deliberately, because the practice just isn't an exact science. You can do everything "right," yet wind up four hours later every bit as confused as when you started. Other times, you may stumble on the answer in five minutes. You just never know.

There are two levels of diagnoses you must make any time you repair something, but their accuracy becomes more critical when you don't have the diagram. The reason is simple: If you get lost, it's a lot harder to find your way back again! Like a crossword puzzle, a circuit can seem very different from what it is if some of the clues are missing.

Level One

The first level is the "macro" level. Look at the radio (or whatever) as a whole and try to decide what might be wrong with it. I've talked about this before, but it bears further thought. Sure, if the power supply is dead, that's a good place to look. In fact, the deader a device is, the easier it probably will be to fix. The toughest repairs are the obscure ones. Perhaps the display flashes on and off, but only now and then. Or maybe the walkie works, but the LOW BATTERY light never comes on when it should. Or the audio is just a little more distorted than it was before. And so on.

In these circumstances, it pays to do a careful job of your detective work. As I've said many times before, rule out as much as you can, starting with the obvious. One trick you can do is to look for conflicts. If the receive audio is poor but transmit is OK, that would suggest that the audio amp might be broken. If, however, the radio uses the same amp for both RX and TX, that's a conflict. Many inexperienced techs will overlook the conflict in their desire to make the diagnosis. Naturally, that diagnosis will turn out to be wrong. As a general rule, if there is a conflict, you are probably looking in the wrong place. As the proverb says, if the puzzle won't fit together, there's probably a piece missing!

Before I get to level two, I'd like to make a special case of the example in the previous paragraph, in which the display flashes on and off, but only occasionally. If you ever want to give a tech nightmares, whisper the ugly word "intermittent." Ugh, I felt a stomach pain just typing it! Nothing but nothing induces frustration like an intermittent. It never acts up when you want it to, and you almost never can be sure you've really fixed it.

The worst offenders are cold solder joints on PC boards. It seems like, no matter where you tap the board, the effect is the same. In fact, sometimes the problem seems worse when you tap on the board far from the actual bad connection. I have never found any foolproof, or even reasonable, way to attack this sort of trouble; you just have to keep trying. By the way, circuits which act up only after the rig gets hot are usually not true intermittents. Thermals are best found with a can of freezing spray. Let the rig act up, and then spray suspected areas until it calms down again. Concentrate on transistors and ICs—they are nearly always the culprits. When you think you've found the trouble, go through the heating/cooling cycle again just to be sure. On rare occasions, I've seen cold solder joints behave in a thermal manner, so I always check the connections before I change the part.

Level Two

I've digressed a bit, so let's get back to the non-intermittent diagnosis process. Last month we discussed how to recognize various stages. Once you've decided to concentrate upon a particular stage, how do you find its inputs and outputs and start troubleshooting? Let's look again at the various stages, this time delving into their innards.

Power supply regulator: If it's a transistor in a linear regulator, you should find a zener diode near the base. I say "near" because there could be some resistors in between the two. Check that the voltage appearing on the zener is whatever is specified for that type of zener. Look the part up by its part number. If, for example, it's a 9-volt zener, you should find about 9 volts across it. Don't worry about small fractions of a volt, but if it reads significantly *more* than 9 volts, it is open and should be replaced. If there's *less* than the rated voltage, the diode may be OK, and simply may not be getting enough voltage from the rest of the circuit.

One end of the transistor, either the emitter or the collector, connects to the output of the rectifier/filter area, and the other end goes to the final filters and then feeds the rig. Measure the two voltages with respect to ground. If they are the same or nearly so, the transistor is most likely shorted. If there's at least 0.7 volts difference, the transistor may be OK. Here's an easy way to tell: Kill power, disconnect the base and connect it to the emitter. Now turn it back on. If the output disappears, the transistor is not shorted, and is probably OK.

If there's no output at all to begin with, check that there's voltage at the input of the transistor. If there is, and the base has something on it, too, then the transistor is very likely open.

IC regulators are a bit trickier, but they are just collections of transistors, after all. There will still be an input and an output, with some sort of feedback from the output to an "adjust" terminal, which corresponds to the base of the transistor in the discrete version. Troubleshoot them the same way.

Switching regulators, which aren't common in radio equipment, are distinguished by pulses at the transistor base or on one of the IC pins. In a previous column, I discussed them in some detail. Switching regulators in otherwise linear supplies are OK to work on, but try to stay away from full switching power supplies unless you have an isolation transformer and really know what you're doing. They are just too dangerous to poke around in because much of the circuitry is connected directly to good ol' deadly AC wall power.

In my June column I made the erroneous statement that a variac could be used to isolate the AC line. As pointed out by Ted WA2RGB, a variac does not provide isolation from the AC line and should never be used for that purpose. Thanks Ted for the info.

Yikes, I just noticed I'm out of room again, so we'll have to continue this next month. See you all then. 73

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Improving the VFO

Last month I described one of my personal favorites, a VFO. I've been using this circuit for a very long time, with excellent results. However, there is always room for improvement. This month we'll take a look at the modifications I made to the circuit.

Since the VFO operates as long as the supply voltage is connected, using the VFO in a transmitter could cause trouble. You would "hear" the VFO on the receiver, which would mask out all but the strongest signals. Of course, this is not what we want. To be a happy camper, we need to move the VFO's signal out of the range of hearing.

There are several ways to do this. First, we could just remove the 12 volts from the VFO. But this could cause the VFO to drift from short-term instability. Second, run the VFO at a different frequency altogether. Too much trouble. Or we could just shift the VFO's frequency out of the way—by far the best bet.

Shifting Frequency

To shift the VFO we can either add capacitance or inductance. Either one has the same effect; the frequency of the VFO is lowered. Take a look at Figure 1. This simple circuit will lower the frequency of the VFO by adding a small amount of capacitance to the tuned circuits.

As the figure shows, C4 is a piston-variable trimmer capacitor. I chose this type of capacitor because they're cheap, easy to come by, and very stable.

Here's how it works. When the VFO is operating normally, C4 is out of the circuit; everything operates normally. When the offset line is turned on by the application of 12 volts, D1 is turned on. This connects C4 to the tuned circuits of the VFO, adding capacitance, thus *lowering* the VFO's frequency. The choke keeps RF out of the offset circuitry and other switching systems. Now why use a trimmer capacitor, besides the above reasons? Well, for one thing, you don't have to use one if your VFO is only for a transmitter. Just replace the trimmer capacitor with a fixed capacitor of small value, such as 4.7 pF. You don't want to add too much; it might cause the oscillator to stop.

As for the trimmer, when you're building a matching direct conversion receiver for the transmitter, you can use the free-running VFO. In fact, you'll need the VFO for injection to the mixer. By using a variable trimmer capacitor, you can do a little bit of magic: transmit offset.

Fine Improvements

When the T/R controls switch over from receive to transmit, the capacitor will again switch into the tuned circuits. By adjusting this capacitor, we can produce a 750 Hz offset, just right to keep from leap-frogging across the band.

We can also make the VFO a little better by removing the zener diode and replacing it with an outboard regulator. This simple regulator circuit, shown in Figure 2, must be installed away from the VFO. We don't want the heat generated by the IC to affect the frequency-controlling components of the VFO.

To help clamp the RF voltage and secure stability, add a 1N914 diode across the 39k resistor on the gate of the 2N3819.

The entire VFO *must* be shielded. Use double-sided PC board if necessary. It might not look too good, but it does work. Since there is no PC board for the offset circuitry, I used a small piece of perfboard, mounting it as close as I could to the main VFO board. Be sure to pot the entire perfboard with silicon sealer, as this will keep microphonics to a minimum.

Use feed-through capacitors for the offset control lines and for +Vcc to the VFO. Shielded cable for the output is also a good idea. If you don't like messing around with the RG-174/U cable, shielded microphone cable works quite well and it's a lot easier to work with. Radio Shack sells a roll for a couple of bucks. Another good source for this cable is old audio patch cords. I always have a pile of cables with a bad end. Cut the ends off, and you've got a good start on some fine shielded cable.

Now that most of the electronics of the VFO have been built, here are a few thoughts on the mechanical side. The difference between rock-solid tones and a warbler can be traced back to mechanical construction.

Housing, Drives, and Calibration

I prefer to use a small aluminum box to hold the VFO. This box provides both shielding and structural support. Also, it's much easier to mount feed-through capacitors. And, unlike PC board shielding, I can always open the aluminum box to fix whatever might go wrong. PC shield boxes can be a real bear to get apart. Photo A gives an inside view of the VFO and the offset circuit. Notice the amount of RTV sealer on the toroid.

This brings us to the last problem with home-brewed VFOs: How do you get that velvet smooth tuning of commercial rigs? Well, you don't. It's that simple. You can come close, but you'll never get the feel of a TS-440 from a home-brew rig—unless you have lots and lots of money to play with.

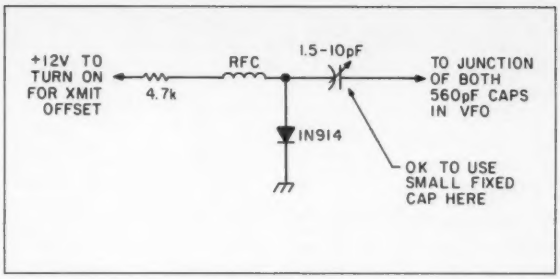

Figure 1. This circuit adds a small amount of capacitance to the tuned circuits, thereby lowering the VFO's frequency.

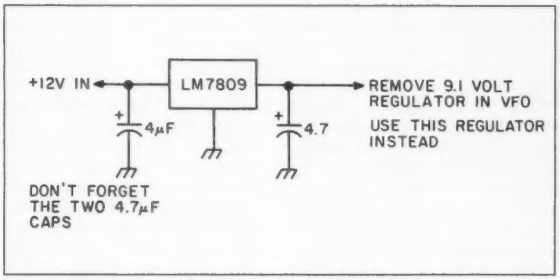

Figure 2. Remove the zener diode and install this simple regulator circuit.

A vernier drive is a must. In fact, it's common practice to use TWO vernier drives, one to turn the other. This allows for very fine tuning, but at a cost. You can't move quickly from one end of the band to the other. Jackson Brothers make the finest drives around, but they're not cheap. The imported vernier drives never seemed to hold up for me. And they always made my home-brewed projects look, well, home-brewed! Regardless, get the best drive you can.

Calibration is another problem with a home-brew VFO. How do you know where you are? In my case, I don't really care. I just adjust the VFO for the band I'm working and leave it there. I adjust the very low end for, say, 7.025 MHz and let it go at that. When I tune up the band and I hear RTTY, I have a good idea I'm near 7.080. When the CW slows down, I'm in Novice country. On hearing SSB from the speaker, guess what? I'm in the phone bands. Now, of course, this really plays havoc when you're in QSO with a guy who asks you to QSY up 2 kHz. You call me! A 100 kHz calibrator with outputs at every 25 kHz works well, too. You'll know you're at least 25 kHz close to something!

Instead of my method of dial calibration, you can use a digital readout from a frequency counter. However, this spoils portability unless you have a very small frequency counter.

The problem with VFO calibration is linearity. The capacitor we use for tuning the VFO is not linear from one end to the other; that is, the changes in capacitance are not linear as you move the capacitor through its range. You might end up with more capacitance on one end than on the other. The same thing happens with inductors. Some of the frequency spread will be on one end of the dial, while on the other end, it's all jammed together. A perfect example of this occurs in the old Alda radios. On the 80 meter band, the CW portion had wide gaps between the dial markers. Moving toward the higher end, frequencies were piled on top of each other. Instead of fixing the problem, Alda changed the symptom. They re-marked their dial to compensate for the nonlinearity of the VFO.

There are two fixes for this problem. One, you can tune the inductor and not the capacitor. By changing the pitch of the windings, you can fool the tuned circuits into thinking they're linear. Called "permeability tuning," this is the most common method used in analog VFOs. An older method required changing the shape of the rotor plates of the tuning capacitor. You don't see this done today, but you can find examples in the older shortwave receivers.

Next month we'll look at some VXO circuits. I also have a special treat for the QRP builders out there. Hint: think small.

Before I call it a day, this issue marks the third year for the "QRP" column. I want to thank all of you who have written me your comments and thoughts. You're always welcome. As I said in the first issue way back in October 1987, this is your column, dedicated to the low-power enthusiast. 73

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

The Greatest Day of My Life!

I have just returned from the most delightful afternoon of my life. I was at a wedding. A wedding so totally filled with the aura of love that all of us in the church could feel it and share in it. The bride and groom have known one another for less than a year, but in all of my 48 years I have never seen two people who more fit the old adage, "made for one another."

Why write about a wedding in a ham radio magazine? Well, the simple truth is that one of the newlyweds is a ham, and, if you have ever seen the ARRL video titled "The New World of Amateur Radio," then she is someone many of you already know. Her name is—or should I say that her name was—Kelly Howard and at age 19 she has become the bride of Mr. Steven Lenhert.

Kelly entered my life about four years ago when I was co-producing the aforementioned ARRL video. We were looking for some youngsters with ham tickets to co-host the show with Roy Neal K6DUE and one of those suggested was a fifteen-year-old from San Diego, California, with a General Class ticket and the callsign N6PNY. I quickly became friends with both Kelly and her mother Patty N6LKC. In 1988 Kelly began making the rounds at some of the local ham conventions on my panel sessions to speak about young people in ham radio. In February of 1989 Kelly came with Roy Neal K6DUE, Frosty Oden N6ENV and myself to tape interviews with U.S. Senator Barry M. Goldwater K7UGA. Roy did the one on Goldwater's views on code-free licensing, but it was Kelly who was able to show Barry Goldwater as the ham who truly loved young people and was willing to advise them.

You have probably never seen that interview. It became the pilot for an educational series that Kelly and I were thinking of, but which never got enough funding to get off the ground. We called it "Today's People—An Interview with Barry Goldwater." Kelly co-wrote it and co-edited with me—the latter on a rented Betacam edit system on my living room rug! It's really good to show youngsters in a classroom or maybe in recruitment sessions for young hams. Maybe one of these days I'll run an ad and make copies available on VHS, but for now it sits in my collection of completed video projects awaiting further action.

In the spring of '89, after she graduated from high school, my wife Sharon invited Kelly to come and live with us. She was with us for about six months during which time we taped a second "Today's People" which we subtitled "Mr. Umpire." It was a one-on-one interview with a former major league umpire named Al Kaplon. Kelly, who knew almost nothing about baseball, was so able to get in-touch with Al's feelings while on camera that Al later confided in me that Kelly was a far better interviewer than most of the full-time professionals on whose shows he had guested. Kelly was with us until about the first of this year when she got her first apartment and moved out on her own. It was at about this time that she joined the First Assembly of God Church of Burbank, and it was there that she met the man who would become her mate for life this past July 28.

I have to tell you that it was possibly the most emotional moment of my life as I watched Steve and Kelly vow eternal love for one another. I was awestruck as I listened to Steve sing a special song of love to his new wife as they stood hand-in-hand at the church altar. Then followed their receiving first Holy Communion as man and wife. The beauty of these few precious moments will remain with me until the end of time.

So, why write about this wedding here in *73*? After all, it's barely a ham radio related story. But you have to understand that I never was blessed with children of my own and I honestly feel as if Kelly was for me the daughter I never had. And maybe these are the words of a very proud "want to be father" who wants to share this joy with you—especially the "you" who became hams after seeing Kelly at age 16 explain our magical world that we call "The New World of Amateur Radio." At 19, Kelly, the young woman who I at times joked as being my "honorary daughter," was truly a beautiful bride!

Tom McMillan WB3HGW, the Man Who Got Waivers for the Handicapped

In June, radio amateurs in the United States learned that intercession by His Majesty King Hussein JY1 had lead to pressure from the White House to change the Part 97 regulations regarding the administration of Morse code examinations to handicapped applicants.

Specifically, the Commission has modified Part 97 to permit waiving Morse code tests for handicapped persons wanting to upgrade from Novice or Technician to General, Advanced or Extra class. The FCC has also directed those administering Novice exams to handicapped applicants to make special provisions in the testing process to include permitting a handicapped person to copy the 5 word per minute test one phrase, sentence or word at a time.

This change is basically the result of efforts by a Pennsylvania amateur who has tried to upgrade for almost a decade, but who suffers from a malady that keeps him from copying code at speeds greater then 5 words per minute. When Tom McMillan WB3HGW wrote to JY1 asking him to intercede he had no way of knowing the impact that his letter would have. He was as surprised as anyone, as you will read in the one-on-one interview that follows.

Newsline: Tom, how was it you took on trying to obtain the waiver system for the handicapped?

McMillan: I was originally licensed in 1975. Through the years I have practiced and practiced to try to get it [an upgrade] and just could not. I even went to a couple of neurologists, one of whom was an amateur and I was told that I probably would not ever be able to copy code at different speeds.

But I have always been the type [of person] that, when you told me that I could not do something I worked harder to accomplish it. But, it just came to the point that I had to admit to myself that I was never going to get to 13 words per minute.

Newsline: Why is that?

McMillan: I have epilepsy, and as the doctor stated in his letter to the FCC, the medication that I am on slows the brain action down even slower. So, my doctor wrote the letter to the FCC.

Newsline: And what happened then?

McMillan: It was sometime in 1988 that I presented the letter to the FCC, but they were pretty staunch in their position of not granting exemptions. In fact, I never even heard from them at that time. [Even after] letters that were written on my behalf from a VE here in Johnstown, and my letters to the ARRL, all they did was send me a letter saying that they had turned it over to the Courage Handi-Hams, who, in their letter, said that they were sure that they could teach me the code somehow so that I could pass the test.

But, like I have been telling the FCC for years, it is not the test that is given, but, rather, the speed. The epilepsy and the amount of brain damage I have just will not allow me to copy it at a faster speed.

Newsline: Did you then contact the Handi-Hams?

McMillan: Not really. They are a truly good organization, but I knew that no matter what they presented as the test, I could not pass it. I had already tried everything that anybody had ever suggested and probably more. At that point I wrote to King Hussein. That was back in September of 1989.

Newsline: Why go to someone outside the United States?

McMillan: Well, it seemed as if everything I had tried here in the United States didn't work. I talked to the FCC on the phone. I got one call from the FCC on the phone. I forget exactly who it was from, but he said that under no circumstances would the FCC ever grant a waiver on the code.

Like I said, I probably tried just about every route I could think of in the states. One night I was lying here trying to think of what else I could do and so I wrote to King Hussein.

Newsline: What happened from that point?

McMillan: That was on September 4, of 1989. He replied with a letter. His 'Royal Communicator' signed the first one that I received and it said that he did write a letter to President Bush and that he [Hussein] felt that something could be done. In the first part of February of this year I wrote to King Hussein again and he replied and said that he had written to President Bush and that President Bush had assured him that there would be some way that they [the government] could help.

Newsline: Did you expect action or did you feel you were being placated?

McMillan: I had heard stories through the years that King Hussein has helped other amateurs in various ways and that's why I wrote to him.

Newsline: Then, were you surprised to hear from him?

McMillan: I figured that he would respond. Most people in those cases would because it is good will between the two countries. He is an amateur and every so often he does go on 20 meters, although I haven't talked to him. I talked to one person in the Royal Palace in 1988 on 10 meters, but I have never spoken with the king himself.

Newsline: Obviously it had some impact.

Mc Millan: Well, President Bush—I don't know if he gave the letter to the State Department, but I assumed he turned King Hussein's letter over to them and requested intervention on my part. The State Department and the National Security Agency were involved.

Newsline: Did they contact the FCC?

McMillan: What they did was go to the FCC board [commissioners] and they had to get the approval of the five members in order to grant the waivers, so they have actually changed the law.

Newsline: You were hoping for an exemption for yourself. Did you expect it to be across the board for all of the handicapped?

McMillan: In my letters I stated that I hoped they would not treat it as a single issue because different people with different handicaps certainly could offer good radio service to various groups and handle a lot of different types of communications. So, I was glad to see that it was not treated as an isolated case. They were changing the laws, not only here in the states, but also internationally.

Newsline: Playing devil's advocate for a moment, what's to keep someone now from going to King Hussein, or Barry Goldwater, and saying that "...the FCC is willing to waive the code test, but I can pass the code but not the theory..."? What about theory test waivers?

McMillan: Unfortunately, I did open up a big can of worms, and it is an area where the FCC and its counterparts throughout the world are unfortunately going to have to deal with the situation.

The thing here is that anyone who can read should be able to pass a written test, but where my argument was in

regard to exemption from the code was the brain damage that I have. It cannot be repaired. No matter what technique is used, there is no way to increase the speed of my brain processing it.

Newsline: What about CW?

McMillan: I actually believe that there should be a code requirement and I am against them [FCC] dropping the code as a requirement!

Newsline: Are you proud of the fact that you have been able to help other handicapped people in this way?

McMillan: Yes. I have been disabled since 1973. I was originally hurt in a coal mine. I had my back broken and my spinal cord severed and I have suffered from epilepsy since I was two years old. So, I don't mind fighting for someone's rights whether it is popular or unpopular. I believe that I was being discriminated against because of my disability and I figured that I would fight it. Luckily enough I won, and I am proud that I am the first one to get it done. It is really a shame that I had to go outside of the country to someone like King Hussein, but that was just one more avenue I had to try. And, it worked.

Newsline: Is upgrading next for you?

McMillan: I would like to eventually get my Extra Class license. I have the applications and everything here to join MARS. I have a son in the Navy and a nephew in the Army, so once I get my General class license I will join the MARS net.

Newsline: I understand you are already a net control station and have been honored by your radio club.

McMillan: In April of 1988, the Hilltop Repeater Association honored me with a plaque for dedication as a control operator on our Sunday evening net. I ran the net for about two-and-a-half years, and I have been a [repeater] control operator for about the same amount of time.

Newsline: Earlier you said you favor a code requirement. What do you think about the proposed no-code license?

It is hard to say what the FCC is doing. You don't know for sure because you get too many interpetations. I guess we are really going to have to wait till they come down to it in the last draft.

FLASH: As we are completing this article on Friday, July 13, the United States Senate passed and sent on to the president for his signature the omnibus "Americans in Disabilities Act of 1990." The house of Representatives had previously passed an almost identical bill and President Bush has promised to sign it into law as soon as it arrives on his White House office desk. The bill directs the public and private sectors to make sweeping accommodations for the nation's several million disabled citizens, and does this with the force of federal law. Peyton Moncure, another individual who has been a moving force behind abolishing all Morse code testing for handicapped applicants for amateur radio licenses, has vowed to use the terms of the act in court to achieve this goal before the end of 1990. My friend Steve Bauer KC0HF, himself visually handicapped, interviewed Peyton Moncure for the pre-net audio for the July 22nd No-Code National Teleconference radio net. With the next move in this story really up to Moncure, I have decided to continue this series and will bring you that interview next month.

"McMillan: I actually believe that there should be a code requirement . . ."

McMillan: Anybody with any intelligence should be able to pass the test at 5 words per minute. So, I can't see them [the FCC] granting a waiver from the code on this codeless license while giving them all the privileges of a Novice and a Technician class license in voice.

If they go with a codeless license, meaning totally codeless and including 10 meter voice privileges, they will create a big problem with people who have run CB for years—run power and run it illegally—because it'll make it easier for them to get a Novice or Technician class license.

Richard Burton—Chapter Two

As we noted in our last column, former ham Richard Burton was arrested last spring and charged with three counts of operating a radio transmitter without a license. This was not Burton's first brush with the FCC over ham radio matters. He had his license lifted almost a decade ago over other regulatory violations. He was eventually charged with a misdemeanor of operating without a license when he refused to go off the air after receiving an FCC order to do so. He served seven months in prison and several years on probation. According to the FCC, he apparently didn't learn his lesson.

As we said, Burton was arrested again last spring, but this time the charges were of a felony nature. Burton protested his innocence, but the evidence was apparently overwhelming against him on one count of the indictment. At 1:52 PDT on July 20, 1990 a jury sitting in federal court in Los Angeles convicted Richard Burton of one count of operating a radio transmitter without a license. The former WB6JAC now faces a possible fine of up to $100,000 and/or up to two years in federal detention. Sentencing is scheduled for October 1. 73

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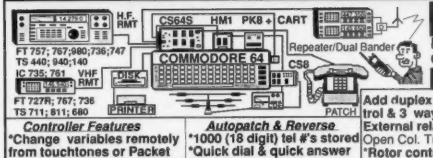

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CIRCLE 372 ON READER SERVICE CARD

Above and Below 2 Meters

Know what you're hearing.

by Chuck Gysi N2DUP

If you've bought a new 2 meter rig in the past couple of years, chances are the radio has more capability than you realize. While you're driving down the interstate rag-chewing with the gang on the repeater, it might pay to check out the action on the rest of the VHF spectrum your radio can receive.

What Are You Missing?

Almost all new 2 meter mobile and hand-held radios are capable of tuning in the 138–144 and 148–174 MHz bands above and below the 2 meter amateur allocations. But unless you have an idea of what lurks beyond the boundaries of our beloved 2 meter band, you may not know what you're stumbling on. Any ham with a 2 meter rig that can tune in 138–174 MHz can eavesdrop on a host of radio users, including the local police, fire departments, the military, tow trucks (after making the patch, make sure the hook's en route), mobile phones, marine channels, the FBI, the Secret Service, and even the good ol' FCC.

We'll take a look at the spectrum surrounding 2 meters and see what you might tune into the next time someone's making a long-winded phone patch while you're sitting in rush hour traffic. Commercial users usually have 15 kHz spacing between channels, while the federal government most often uses 12.5 or 25 kHz channel spacing.

Military Bands

First of all, the 138–144 and 148–150 MHz bands are used almost exclusively by the military. If you can scan down to the 136–138 MHz band, you might stumble across some satellites sending weather pictures and the like back to earth. Types of military activities you can hear would be military police, security police, war games, medical units, fire-crash crews, fueling operations, phone patches by the brass, etc. In fact, you'll probably hear MARS operations just above and below 2 meters, which you can recognize by the distinguished callsigns MARS stations use.

Several Navy and Marine Corps installations use 140.100 as a crash net frequency. In addition, the next time someone accidentally sets off an emergency locating transmitter (ELT) beacon in their garage on 121.500, you'll probably hear Civil Air Patrol units DFing the signal on 148.150 (repeater output) or 143.900, the repeater's input frequency.

Photo A. Nearly 100 portable pack sets are in service at the Santa Fe Railway's computerized car classification yard at Barstow. (Courtesy of the Santa Fe Railway.)

Mir Downlink

One popular frequency you should definitely give a listen for is 143.625, the downlink frequency cosmonauts use aboard the Soviet *Mir* orbiting space station. You can hear the cosmonauts easily with a handheld if they are communicating with a ground station while passing within range of North America.

On the Road Frequencies

From the military bands, we move right along where you'll find tow trucks and auto clubs in a band of 11 frequencies from 150.815 to 150.965. Then there are 10 frequencies from 150.995 to 151.130 used for highway maintenance. This can range from your town's road department to maintenance and highway patrol units on toll roads. Forestry conversation channels, used by park rangers, fish and game wardens, environmental quality and response units, and marine police, can be found from 151.145 to 151.475.

Large-scale construction firms as well as farming use a band from 151.490 to 151.595. The frequency of 151.505 is reserved for itinerant use and might be heard on job sites. Another itinerant frequency, 151.625, is a catch-all channel for businesses, especially those that move about from city to city.

Mobile Phone, Construction and Movie Crews

Although the Electronic Communications Privacy Act prohibits the actual monitoring of voice paging and mobile telephone calls, who's to tell if you stumble across such communications in the 152.030 to 152.240 and 152.510 to 152.840 bands? In between, you can hear taxi dispatchers on 152.270 to 152.450 (with the cabs transmitting on 157.530 to 157.710).

Frequencies from 152.870 to 153.725 are used by motion picture crews, heavy construction (including fuel oil delivery), manufacturers, logging and paper mills, petroleum production, and power and water utilities.

The "Public Safety Band"

The police, fire department, ambulances, hospitals, veterinarians, school buses and other municipal services, use the 153.740 to 156.030 band. Some channels can be used by any local government, while others are allocated specifically for police or fire communications. A few business band channels are tucked in here, too, from 154.515 to 154.625. Two such channels, 154.570 and 154.600 are low-power, 2 watt channels for business and other purposes, including the order boards for drive-throughs at McDonalds across the country. The next time you drive through for a Big Mac, you can listen to yourself order.

Police Emergency Channel

Another frequency of note is 155.475, the nationwide police emergency channel typically used for mutual aid.

You'll find more highway maintenance channels from 156.045 to 156.240. There is no standard for repeater pairs for commercial users. Thus, a 156 MHz channel may be used as a repeater input in one area, while the same frequency may be used as an output somewhere else. It is not uncommon for repeaters to bring up other repeaters if the same CTCSS tones are in use.

Marine Band

The marine band runs from 156.275 to 157.425. Channel 16, 156.800, is the distress and calling frequency, while the Coast Guard uses 157.050 to 157.175. You can hear telephone calls from marine users on the output frequencies of 161.800 to 162.000. Typically one or two channels are assigned to a given area. Vessels are paged for phone calls on 156.800.

Utilities, Heavy Construction, and Industry

Some more tow truck channels run from 157.470 to 157.515, while water and power

utilities use 158.130 to 158.265. Manufacturers, heavy construction, forest products, and petroleum production use up 158.280 to 158.445.

Police and local government channels as well as highway maintenance frequencies run from 158.730 to 159.210, with forestry conservation and environmental units operating from 159.225 to 159.465.

Trucking companies and armored cars use 159.495 to 160.200. And if you're a railroad buff, try tuning in 160.215 to 161.565. Here you'll find road and yard channels as well as talking hotbox detectors and railroad police. If it's on the rails, it's using radios.

News and TV

And if you want to keep on top of what your favorite TV or radio station is up to, try tuning in 161.640 to 161.760. This is where you'll find live remotes, traffic helicopters, news crews, and cues to reporters. Additional frequencies include 166.250 and 170.150, except within a 150 mile radius of New York City, where they're used for fire departments.

If you want to hear what your local newspaper is up to or where your newspaper carrier is, try 173.225 to 173.375. Some water and power utility frequencies fall between the newspaper frequencies.

Federal Directory

Last is a band of intrigue, the 162–174 MHz federal band. Here you'll find secret agents, the military, park rangers, investigators, and tax collectors. Here's a look at how the band is roughly broken up for various agencies:

FBI—162.6375 to 162.7875, repeater outputs; 163.825 to 164.550, repeater outputs; 167.150 to 167.7875, repeater inputs and simplex operations. Every FBI field office uses 167.5625 as Channel 4 on a nationwide basis for coordination. The static you may hear on these channels is Digital Voice Protection scrambling.

Secret Service—While this agency is charged with dignitary protection, they also chase counterfeiters. Try the following popular frequencies: 165.7875, Channel Baker; 165.375, Charlie, command post channel; 165.2125, Mike; 167.025, November, White House Advance Team secondary; 164.8875, Oscar, motorcades; 164.400, Papa, counterfeit operations; 166.700, Quebec, White House staff; 166.5125, Sierra, presidential protection, White House Advance Team primary; 164.650, Tango; 166.4625, X-ray, Treasury Department common channel; 162.6875, Yankee, on-site phone patch input; and 171.2875, Zulu, on-site phone patch output. Code names are used by agents to refer to protectees, i.e., Reagan was "Rawhide" while Bush is "Timberwolf."

FCC—The Federal Communications Commission uses 167.050 as a repeater output (input on 172.800) nationwide, as well as for simplex communications. This is a fun one to keep an ear on. But if you hear units on the input frequency, watch out!

Customs—Check 165.2375 and 165.4625 at ports and airports.

Bureau of Alcohol, Tobacco and Firearms—This catch-all agency deals with smugglers and can be heard on the following channels: 165.2875, 166.5375, 166.4625 (Treasury common) and 165.9125.

US Marshal's Service—Check out 163.200, 164.600, and 162.7125.

IRS—Got taxes due? Keep an ear on 165.950 for criminal investigations. In addition, 166.000 and 167.100 are used for internal affairs.

Immigration and Naturalization Service—These units not only keep an eye on the border, they also roam cities looking for illegal aliens. Listen to 162.825 and 163.625 to 163.675.

General Services Administration—This agency primarily uses radios for protective details in federal buildings. VHF channels include those from 163.0625 to 163.175.

US Army Corps of Engineers—Whether designing a dam or rerouting a stream, the Corps uses 163.4125 and 163.4375.

Federal prisons—Guards use 170.875 and 170.975.

Military—You can hear operations on the following bands: 163.4625 to 163.600, 164.000 to 164.200, 164.500 to 164.600, 165.000 to 165.1875, and 173.4125 to 173.5875. Army, Air Force, Navy, Marine Corps, and Coast Guard units use these frequencies.

National parks—Rangers and support staff use the following: 164.4125 to 164.475, 164.725 to 164.800, 165.000 to 165.1875, 166.325 to 166.350, and 166.725 to 166.975.

Coast Guard—While 165.2625 is used for communications, you can hear marine Channel 16 links on 165.3125 and 171.3375. Channel 16 is the input and the Coast Guard frequency repeats every thing it hears on the channel.

Environmental Protection Agency—You can hear EPA staffers and helicopters on 165.4125.

Federal Aviation Administration—FAA units use 169.250 to 169.375. Also of note is 165.750, which National Transportation Safety Board air crash investigators use.

Postal Service—You can hear postal trucks and investigators on various frequencies in the 164, 169, and 170 MHz ranges.

While this list for federal agencies is not meant to be inclusive, it is a basic look at how the US government divvies up its share of the spectrum.

Scanner directories are a good source of information for finding additional frequencies that may be within range of your 2 meter rig's receive capability. And don't forget to keep an eye in the rearview mirror while you monitor those top-secret agents as they close in on their target.

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The 100 MHz Overtone Oscillator

Last month I covered a temperature control circuit that could be used for a crystal oven control circuit. This month the topic is a crystal oscillator circuit I used in conjunction with the temperature control circuit. The circuits were built to supply a reference frequency for control of a 6 GHz microwave brick oscillator. The bricks normally require an oscillator in the 90 to 108 MHz range, with some tolerances for off-frequency operation. The oscillator circuit shown here will work from 90 to 110 MHz, and you can use it with any brick that requires an external oscillator.

Brick oscillators normally come with an internal crystal circuit, but recent surplus items do not have this feature. I picked up quite a few brand-new 6 GHz bricks, and presume others did as well. Additionally, I have just received some information about a large quantity of surplus high power (10W) 6 GHz equipment, and I've written for details. I'll pass them on as soon as I receive them. It's possible that the circuits might be adaptable to, or even describe part of, the system.

The schematic diagram of a standard internal oscillator was developed by reverse engineering. While other circuits are available that would work, we want one circuit and one set of specifications for a standard crystal. Crystals could then be ordered from multiple sources, making reproducibility and frequency tolerances as close as possible. By eliminating the wobble in the main wheel, we can hold frequency tolerances and stability to an acceptable level. The International Crystal Co. specification is #585132 for a MS-54XOL (Frequency West) type of brick oscillator.

Temperature Control

The oscillator is constructed on a postage-stamp size PC board. Consulting the parts layout, I drilled and reamed all holes for direct connection. I didn't have time to put a circuit board together for this project. See Figure 1, the suggested layout. The small size of the circuit was not done to get you to work with microminiature parts, but to minimize the effects of temperature. The smaller the mass of the box, the easier it is to control the temperature. I searched for a suitable small container and could not find anything I deemed acceptable until I noticed that a short section of waveguide could enclose the entire oscillator circuit.

Each end of the waveguide is closed off with a plate of scrap brass. On one end, I soldered the plate to the waveguide, closing it off. Carefully holding it in position, I attached the other end to the PC board by the component leads. See the construction details in Figure 2. I slid the oscillator into the waveguide, with a small piece of Mylar™ as insulation to prevent shorts. I didn't solder the power feed end of the waveguide; the circuit itself makes a close fit. Also, covering the entire assembly with a layer of styrofoam holds the unit together and gives excellent thermal insulation to the heater circuit. Three connections are mounted on the end plate: 1. DC power, 2. capacitance adjustment, and 3. coax RF out. Leads run out through the foam insulation.

The crystal oscillator, being small, is supported quite well, even rigidly, by the component leads. Usually the circuits I construct are quite large, to accommodate surplus and junk box components. This oscillator is the exception. But don't get me wrong; this is not the only possible arrangement of parts. The prototype was much larger and it worked well. You can change the layout if you wish. Just keep the crystal leads reasonably short, and the modifications should be just fine.

Transistors, Resistors, and Coils

The transistors I used were 2N930 (NPN), but you can use any good UHF type. If you plan to enclose the oscillator in a waveguide oven, you will need a TO-18 case to fit the PC board. This is a small metal-cased transistor about 3/16-inch in diameter. The other components are standard ¼-watt resistors and a mixture of mica and CK-05 ceramic capacitors. The RF chokes were home-brewed using 1 megohm, ¼-watt resistors for the RFC forms. Any high value will do. They showed a good *Q*, about 35 as I recall.

Don't use the inexpensive, imported resistors for the RFCs, since they don't have a flat tubular design. They will work, but winding the coil over a curved surface is a little tough. Use standard ¼-watt symmetrical tubular resistors. See Figure 3 for details.

The three inductors: 0.1, 0.39, and 0.47uH RF chokes, are wound with #36 enameled wire. The 0.1 uH choke required 6 turns spaced about half a wire-diameter apart. The remaining coils were wound unspaced, with tight turns. The 0.39 uH required 15 turns, and the 0.47 uH choke, 18 turns. I adjusted the turn spacing slightly while using a *Q* meter to set the inductance on the mark. But this step is not essential, as the values came out quite close to my first measurements.

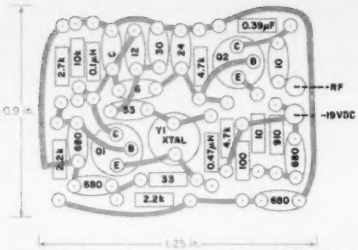

Figure 1. Parts placement. Larger scale (2.5 size) for test setup; 100 MHz oscillator. PC board is 1.25"H x 0.9"W, to fit inside the waveguide in Figure 2.

I coated the finished RFCs with a coat of coil "Q" dope. You could also use shellac or clear fingernail polish. If you use the latter, be sure to use *clear* polish, since some colored types contain metal flek that might cause trouble. The purpose of the coating is to hold the coil, keeping the turns in place.

A positive ground or negative DC power feed makes the oscillator compatible with the brick oscillator. If you wish, you can convert this to negative ground. The second stage of the oscillator unit is a buffer amplifier. This stage isolates the oscillator and load to improve stability and prevent loading of the crystal oscillator.

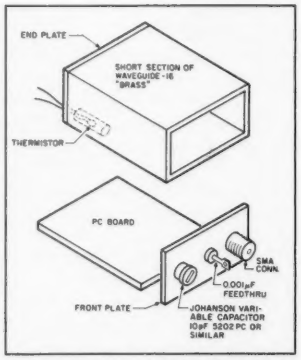

Figure 2. The thermistor is placed in tube on the inside of the waveguide with thermal grease.

Frequency Accuracy

Test the circuit with the adjustable capacitor set to about mid-value so the oscillator can drop out of oscillation. This is normal since the circuit works only over a narrow range of adjustment. If you use the circuit in a non-oven crystal, set the frequency with the capacitor, and that's it. If you use an oven-type crystal, its frequency will be quite high before the oven cycling. Oven type crystals pull low in frequency as the oven is cycling (heating) to its preset temperature. When this is translated, considering multiplication to our 5.7 GHz band, errors in the order of 60 kHz are common.

That equals about 1 kHz at the crystal frequency. You may get tired of hearing about frequency accuracy, but when you relate it to the low bands, remember that most rigs can give a reliable readout to 100 hertz. Why, then, should we not expect the same tolerances for microwave converters? If we are going to use two tin cans and a piece of string, a crystal detector is just fine. Using modern, stable transceivers in this microwave converter application is not only a good use of expensive equipment, it's cost effective, too.

By the way, CK-05 capacitors are really chip capacitors in disguise. These modern capacitor types are enclosed in a square epoxy case. They are very stable and display a higher *Q* than the older disc ceramic types, which you can also use in this circuit. I just happened to be out of some values of the disc types.

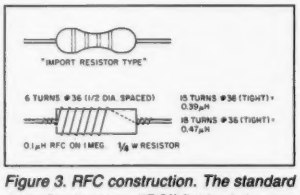

Figure 3. RFC construction. The standard Allan Bradley type "RC" flat body is great for coil-winding.

A note: With diligence and a pair of wire cutters, you can free the chip capacitor from the epoxy case and remove the chip cap for PC board use. You will destroy several caps until you get the hang of how to chip away the epoxy at the edges without fracturing the chip cap inside. I caution you to wear a pair of safety glasses. SAFETY ALWAYS COMES FIRST!

New Products

I have received several requests for information on just where to purchase waveguide for construction projects, and how to determine frequency on the 10 GHz band. Emcom Industries (Ed

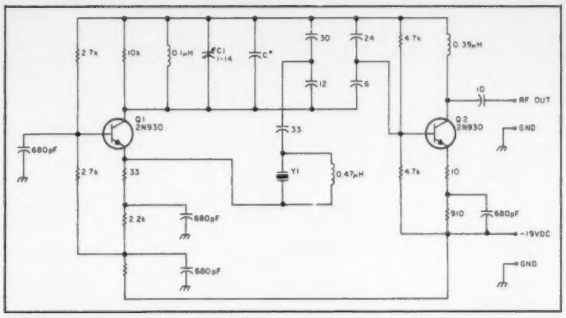

Figure 4. Schematic for the 100 MHz oscillator. Y1 is 85 to 106 MHz, depending on the frequency desired.

Emich), 10 Howard St., Buffalo NY 14206, tel. (716) 852-3711, will accept orders for brass waveguide. Cost is $6.50 a foot, plus shipping.

Two- to three-foot lengths are just right for construction of feed systems for dish antennas, with larger sections used for low-loss home station runs. For comparison, I used some 40 feet of waveguide in my home station on 10 GHz, putting all microwave hardware and high power amplifiers inside the shack for easy modifications and adjustment.

Emcom is currently developing a cavity wavemeter for frequency determination (10 GHz) and has other microwave-related projects in the mill. I will provide details as I receive them.

Mailbox Comments

Ed Cole AL7EB writes that he plans to start 10 GHz operation when he returns from his job in Valdez, Alaska. He says he has collected several CG-176/U couplers and an assortment of 1N23 type diodes to start construction with. He has two military, surplus weathertight boxes that he gutted to hold the 30 MHz IF preamp gunn control, CW IDer, and a MA/COM gunnplexer.

His home is in Hope, Alaska. With Anchorage only 25 miles north over the water, Ed plans line-of-sight communications from the top of his tower to Anchorage. Later, Ed wants to try a shot across Cook Inlet, from Homer, Alaska (1000-foot Diamond Ridge), to Kodiak Island, about 140 miles to the south. Ed says it has been over fifteen years since he was last on microwave, and he is looking forward to getting back on.

Mike Baker in Gainsville, Florida, writes that the local group is interested in putting a beacon on a TV tower and needs a set of plans for construction of "omni 10 GHz antennas." Mike mentioned the slot antenna, and I sent him copies of this design. A 10 GHz slot antenna requires several slots (about six to a side) centered about the middle of the waveguide. The slots couple RF out similar to the way a stacked monopole antenna does.

Our microwave group is experimenting on omni antennas for both horizontal and vertical polarization. The polarization is affected by the placement (front, face, or side) of the slots in the waveguide. Slot dimensions are critical, and while you can construct the antenna at home, it requires care.

At present I don't know of any company selling slot antennas for the amateur budget. Commercial slots manufactured to mil-specs cost accordingly—sky high. I am in the process of testing several variations on the beacon slot antenna, and I'll inform you of results as they develop.

Mail-Box Material

Due to the large volume of mail I receive, next month this column will be dedicated to questions and answers from you, the readers. Going over common problems with circuitry and application, we should be able to clear up some of the basic questions you have submitted to me. Future columns will cover the 6 GHz system I am building, and I will let you know what I find out about the surplus 6 GHz equipment.

Let me know about the systems and frequencies your construction projects involve, and let me know if you have any photos of them for the column. This is your column. Write to me about any ideas you'd like to see developed. I hope you are as wild as I am about building; it's a germ we need to spread around. As always, I will answer questions related to this and other VHF/UHF or microwave items. For a prompt reply, please send an SASE. 73, Chuck WB6IGP 73

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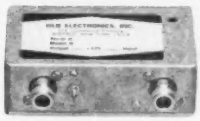

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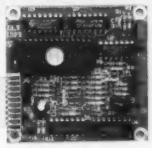

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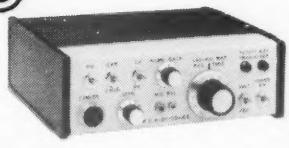

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WANTED: AUTHORS AND MANUSCRIPTS Radio Amateur Callbook, publisher of the world's most comprehensive list of directories and technical books for ham radio operators, is currently seeking potential authors and manuscripts. If you are a licensed amateur and have published technical papers, conducted professional seminars or solved important real-world problems in the fields of commercial and amateur radio; television and satellite broadcasting; and/or telecommunications; we would like to hear from you. We invite you to submit your manuscript proposal and outline for review. For a complete catalogue and Author Questionnaire, please contact Herb Nelson, Radio Amateur Callbook, 925 Sherwood Drive, Box 247 Lake Bluff IL 60044 USA, telephone 1 (708) 234–6600. 8:00 a.m.–4:00 p.m. CDT BNB963

WANTED for my Drake R4C CW-filters 1,5-0,5-0,25. Kettling, 6 Krockhaus, 463 Bochum/Germany. BNB964

KB0ZP CONTEST LOG—(MSDOS) Latest version from author. 4000 Contacts. Scores 15 contests. Separate utilities program for printouts, etc. Unlimited Modes/Bands. Data compatible with your database or file program. QSL information, mailing labels a snap. Restore memory after power down. Many extras. CompuServe 73517,1054. Shareware $5. KEBEL, PO Box 2010C, Sparks NV 89432. BNB965

PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook*. List SASE. FAR Circuits, 18N640 Field Ct., Dundee IL 60118. BNB966

COLLINS KWM-2, PM-2 $450. Galaxy V, VFO, station console, 2000 amp, $275. Kenwood TS-430S, Astron RS-35A, $700. Heathkit SA2500 auto antenna tuner w/ balun, $235. ICOM IC-2GAT, $300. Amplifier parts, much more, S.A.S.E. KJ6KK, Box 898, Pahrump NV 89041. (702) 727–7181. BNB968

WANTED Kenwood TS-790A. WB8ERN, 4839 Beaune, Ludington MI. (616) 843–2162. BNB969

SLACK ENTERPRISES 2 METER J Condo quad, short low band ants & more, 12-page flyer $3.00. SLACK ENTERPRISES: 101 Royal Park Drive, Apt. 2H, Oakland Park FL 33309. BNB967

"Today's People—Barry Goldwater." Meet amateur radio's elder statesman Barry Goldwater K7UGA in an interview taped at the Goldwater Ranch exclusively for hams, teachers and amateur radio instructors. See Barry's station and join teen-interviewer Kelly Howard N6PNY as she questions K7UGA on career, family and amateur radio. 7 minutes and in color on VHS—perfect for classroom instruction and radio club presentation. Produced by the team that brought you "The New World of Amateur Radio." Only $19.95 plus $3.00 shipping/handling prepaid (no CODs) to Bill Pasternak WA6ITF, 28197 Robin Avenue, Saugus CA 91350. BNB970

Continued from page 32

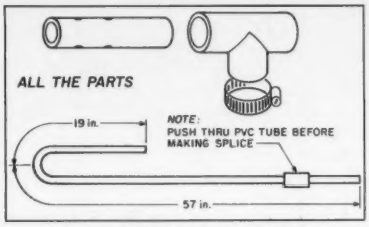

Figure 3. Placing the PVC tubing.

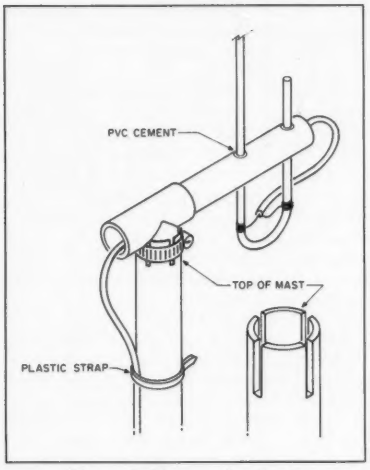

Figure 4. The completed unit.

You will need to strip back the braid of the coax about four inches to have enough room to secure the ends to your clamps. After your final adjustment for minimum SWR, you may want to trim some of this off for a little neater look. It makes little difference which leg you attach the center conductor of the coax to, but I felt that there was a slight edge in having the center conductor connected to the long leg. When I was through playing, that is the way I left it.

Adjusting the Antenna

Hook up a VHF SWR bridge between your rig and the J-Pole. Try different settings of the feed point and, of course, look for the lowest SWR. I tried everything I could think of, from feeding at the end of the short leg to sliding down to the bottom of the "J" loop (that is where I found the best SWR). My SWR is 1.1:1 at 146.00 MHz, feeding approximately two inches up from the bottom of the loop, or about four inches apart around the loop. Even at the band edges, i.e. 144 and 148 MHz, the SWR is less than 2:1.

A little embellishment that won't make the antenna work any better, but will make it look more "factory", is to add red plastic tubing caps on the ends of each leg. Also you may want to drill a small hole in the bottom of the loop to let any moisture that might accumulate inside to drain out.

In this day of cable TV, you should have little trouble finding an old TV antenna. If you don't have one yourself, ask a friend or a neighbor—you can probably get one just for taking it down. 73

The HF5B "Butterfly"™
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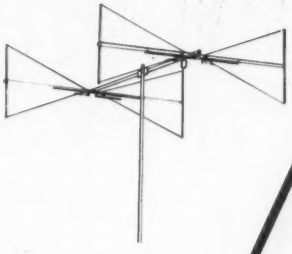

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NEW PRODUCTS

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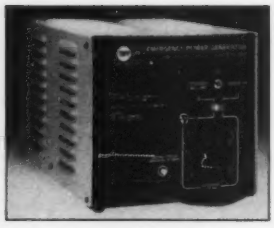
PRODUCT OF THE MONTH

ARI/AMERICAN RELIANCE

The AR-470D from ARI/American Reliance Inc. is a convenient, drop-proof hand-held device that has all the features and benefits of a bench-top LCR meter at only 20% of the price. It displays a fast reading of inductance, capacitance or resistance on its 2000-count, 3½ digit, liquid crystal display. It provides seven inductance ranges from 200 µH to 200H, nine capacitance ranges from 200 pF to 20 mF, and eight resistance ranges from 2 ohms to 20 megohms, offering a maximum resolution of 1 milliohm. In addition, with its D factor feature and 120 Hz/1 kHz test frequencies, the 470D can be used in the following applications: finding opens or shorts in transformers and transmission lines; capacitance and resistance measurements for surface-mount or chip-type components; precision measurements of milliohm applications; and phase detection, mutual inductance, and ratio of turns for transformers. There is a "low battery" warning with the built-in LOBAT display, as well as dissipation factor measurements. SMD or chip-type component test probes are available.

The AR-470D is priced at $250. Contact *ARI/American Reliance, Inc., 9952 E. Baldwin Place, El Monte CA 91731. (818) 575–5110; FAX (818) 575–0801.* Or Circle Reader Service No. 201.



TRIPP LITE

The new Tripp Lite EPG-1200 is a solid-state, 120 VAC electronic power generator designed to take the place of gasoline-powered generators during blackout conditions. The EPG-1200 provides clean, quiet, safe emergency power in a compact unit where the pollution, fumes or noise of such a generator are unacceptable or impractical. It supplies up to 1200 watts of regulated AC power from the user-supplied battery pack. Simple, manual switchover operation powers equipment during blackouts for extended periods. Frequency-control to within ±½ Hz lets frequency-dependent equipment like VCRs operate perfectly.

A heavy-duty 20 amp battery charger recharges the battery bank whenever AC line power is present. A low-voltage cutoff circuit prevents the unit from over-draining the batteries during operation. The EPG-1200 features four AC outlets and manual switchover from AC line power to inverter operation. The rugged, no-maintenance construction will give you years of trouble-free service.

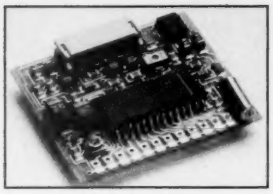
The suggested retail price is $620. Contact *Tripp Lite, 500 N. Orleans, Chicago IL 60610-4188. (312) 329–1777.* Or circle Reader Service No. 204.

VAN GORDEN ENGINEERING

The Hi-Q antenna end insulators from Van Gorden Engineering are rugged and lightweight, and have high dielectric qualities and excellent resistance to weather conditions. These insulators can be used as guy wire strain insulators, as end or center insulators for antennas, for constructing antenna loading coils, for designing multiband traps, and for building rotary inductors in tank circuits. They are designed to be used in either a strain or compression type installation. Spiral ribs let you wind loading coils or traps right on the insulator.

Hi-Q Antenna End Insulators are available from most ham radio dealers for $4 per pair. For more information contact *Van Gorden Engineering, P.O. Box 21305. S. Euclid OH 44121. (216) 481–6590; FAX (216) 481–8329.* Or circle Reader Service No. 205.

COMMUNICATIONS SPECIALISTS



Ever since the introduction of digital continuous tone-coded squelch systems, radio shops and hams have been asking for an "after market" manufactured board. Now Communications Specialists, Inc. is offering the DCS-23 Digital Encoder-Decoder, compatible with all DCS systems. This new board is constructed using surface mount technology. It measures just 1.36" x 1.18" x 0.25", permitting installation on all mobile and most portable radios. All industry-standard digital codes are field-programmable using simple PCB jumpers. The board's design uses a crystal-controlled CMOS microprocessor which permits operation on 6 to 20 VDC at 8 mA. All connections are made with color-coded jumper wires connected to a microminiature plug and socket.

The DCS-23 is priced at $60 and comes with an illustrated brochure and instruction sheet, and a one-year "no hassle" warranty. Contact *Communications Specialists, Inc., 426 West Taft Avenue, Orange CA 92665-4296. Phone (800) 854–0547 or (714) 998–3021, or 24-hour FAX (714) 974–3420.* Or circle Reader Service No. 202.

BRIAN BEEZLEY K6STI

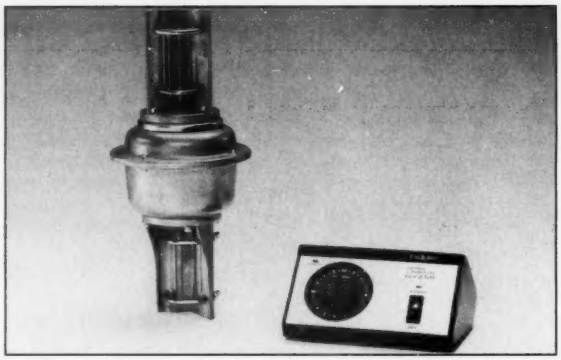
K6STI has released a new MNC program for IBM-compatible computers. MNC uses optimized, hand-coded assembly language in the kernel code of the MININEC algorithm, substantially improving performance. Unlike compiler-generated code, MNC uses inline coprocessor instructions for maximum speed. In addition, MNC makes full use of the on-chip coprocessor stack to minimize slow off-chip memory accesses. Where possible, MNC maximizes parallel execution of host processor and coprocessor instruction streams. MNC is believed to be the fastest implementation of the MININEC algorithm ever attempted on a personal computer.

MNC is offered as a $40 option for the MN 3.5 antenna analysis program. MN 3.5, priced at $85, features a three-dimensional display of antenna geometry. Contact *Brian Beezley K6STI, 507½ Taylor St., Vista CA 92084.* Or circle Reader Service No. 206.

CHESTER QSL CARDS

Chester QSL Cards now offers you the ability to order QSL cards on-line using their new Bulletin Board System. You can also monitor your order and obtain current information regarding shipping dates. By using the BBS, you can save $5 on your order to help offset the cost of your call. You can also request free samples or order form packets. The only terminal requirement is the ability to display 80 columns and 24 lines. You may access the bulletin board from 6 p.m. to 8 a.m. CST Monday through Friday, and 24 hours a day Saturday and Sunday. Other options on the BBS include a message center and the ability to upload and download files.

To access the bulletin board, phone (316) 342–8818; 300, 1200, 2400 baud, 8 bits, no parity, 1 start, 1 stop. For more information, contact *Chester QSL Cards, 310 Commercial, Emporia KS 66801. (316) 342–8792. Or circle Reader Service No. 207.*



YAESU

Yaesu USA has announced a new light-duty rotator, the G-250, designed for light to medium UHF, VHF and FM radio and television antenna arrays for remote control operation. The controller is a desktop unit which provides 360° indication of actual antenna compass direction. Like all Yaesu rotators, the G-250 is designed to last a lifetime. It is housed in weatherproof, melamine-coated die-cast aluminum, and is permanently lubricated to insure maintenance-free operation under all climate conditions.

The suggested retail price for the G-250 is $111. Contact *Yaesu USA, 17210 Edwards Road, Cerritos CA 90701. (213) 404–2700.* Or circle Reader Service No. 203.

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Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check /HAMFESTS on our BBS (603–525–4438) for listings that were too late to get into publication.

Visit the 73 booth at
. . . Boxboro, MA on Oct 13 & 14
. . . Brooklyn Park, MN on Oct 27

OCT 5–14

PERRIS, CA The Lee De Forest ARC, assisted by six local ARCs, will sponsor the Riverside County Fair at 18700 Lake Perris Drive. Special Children's days and Handicapped day. Admission: 12 and under free, adults $5. Call contact for Senior's Day and fee. Talk in 145.240 down 6. Contacts: *Ruth Ann Rich N6HIW, 41020 Benton Rd., Hemet CA 92343, (714) 767–7603.* PKT BBS address *6N6HIW @ KA6JOB. Donna Lindsey N6OKS, (714) 926–4106. Jim Cameron KB6YBP, (714) 927–4555.*

OCT 6

PONCA CITY, OK The Kay Co. ARC, OIDAR and Cowley Co. ARC will jointly sponsor the Northern Oklahoma/Southern Kansas Swapmeet and VE Session. VE Exams start at 0930, at Pioneer Vo-Tech. Walk-ins only. Bring original license and original CSCEs plus photocopies of those documents for your 610 form. Swapmeet starts at 1300 hours at the Ponca City airport. Commercial vendors. Talk-in on 146.97 down. Contact *Mark Byard N5OGP, 504 Foster, Ponca City OK 74601. (405) 762–1966.*

OCT 6–7

WARRINGTON, PA The Mt. Airy VHF RC, Inc. will sponsor the Pack-Rat 19th annual Get-Together weekend Conference/Hamfest. The VHF Conference will be held at the Warrington Motor Lodge Sat. from 9 AM–5 PM. Cocktail hour and get-together at 6:30 PM in the Pack-Rat Hospitality Suite. Dinner at 7:30 PM, $16. Registration $8 in advance (by Sept. 23rd), $10 at the door (includes Sun. Flea Market). The Hospitality Suite will be open Friday evening for early arrivals. Make checks payable to Mt. Airy VHF Radio Club, Inc., and send SASE to: *HAMARAMA, PO Box 311, Southampton PA 18966.* Motel Reservations: *(215) 343–0373.* The Sun. Flea Market will be held from 7 AM–4 PM at the Bucks County Drive-In Theater, rain or shine. $5 at the door, no advance registration. Carload special $8. Tailgating $8 per space (bring your own table). Set-up at 6 AM. Talk-in on W3CCX 146.52 MHz.

OCT 7

HUNTINGTON, IN The Huntington County ARS will sponsor its annual Hamfest at the P.A.L. Club from 8 AM–3PM. Sellers set-up at 6 AM. Free parking. Handicap accessible. Admission $3.50 advance, $4 at the door. 8' tables $5 on first-come basis. Talk-in on 146.085/.685 and 448.975/443.975. Contact *Jim Covey KC9GX, 1752 Kocher St., Huntington IN 46750.*

PARAMUS, NJ The Bergen ARA will sponsor a Hamfest at Bergen Community College from 8 AM-2 PM. Free admission for buyers. VE Exams from 7 AM–10 AM. VE contact: *Pete Adely K2MHP, 13-30 Edward St., Fairlawn NJ 07410, (201) 796–6622.* Free parking. Sellers $7 per space. Talk-in on W2AKR 146.790. Contact *Jim Joyce K2ZO, 286 Ridgewood Blvd. No., Westwood NJ 07675. (201) 664–6725.*

YONKERS, NY The Yonkers ARC will hold a Hamfair, rain or shine, from 9 AM–3 PM at the Yonkers Municipal Parking Garage. Buyers admission $5, under 12 free. Sellers $10 per space (bring your own table). Set-up at 8 AM. No advance registration. Talk-in on 146.52, 146.865– or 440.150–. Repeater: WB2BNH. Contact *Y.A.R.C., PO Box 378, Centuck Station, Yonkers NY 10710. (914) 963–1021.*

SPRINGFIELD, OH The Independent Radio Assoc. will hold the Eighth Annual Hamfest/Computer Expo from 8 AM–4 PM, indoors at the Clark County Fairgrounds. Admission is $4 in advance, $5 at the door, with under 12 free. Tables are $6 advance, $7 at the door. Talk-in on 145.45 and 224.26 MHz. For reservations write: *Independent Radio Assoc., PO Box 523, Springfield OH 45501,* or call *Charlie WA8P, (513) 324–2896.*

HERSHEY, PA The Central PA 99/4A Users Group will sponsor its Fourth Annual CPUG Computer/Electronics Exposition from 7 AM–3:30 PM at the National Guard Armory, Palmdale. Pre-registration accepted through Aug. 3rd. Open to all ham radio, electronics and computer related groups. Contact *Dave Ratcliffe, (717) 238–5414; Barry Long, (717) 564–2974; Anthony (Tony) DeDonatis Sr., (717) 534-2056; Terry Longenecker, (717) 838–7843; The Data Factory, (717) 657–4992 or 4997 24 hrs, 8-N-1 300/1200/2400.*

OCT 13–14

AUGUSTA, GA The ARC of Augusta will sponsor the Augusta Hamfest/Computer Show at the Augusta-Richmond Co. Civic Center Sat. from 9:30 AM–5 PM and Sun. from 9:30 AM–3 PM. Outdoor Flea Market. One tailgating space free, extra adjacent spaces $5. Set-up at 5 AM Sat., 7 AM on Sun. Admission $4 advance, $5 at the door. Dealer 10' booths $40 ea. Flea market 8' tables $10 ea. Make checks payable to Amateur Radio Club of Augusta and mail to *Jim Abercrombie, PO Box 5943, Augusta GA 30906. (404) 790–7302.* Pre-registered VE Exams at 9 AM Sat. Walk-in VE Exams at 1 PM Sun. Send your completed 610 form with check for $4.95 made payable to ARRL/VEC to *Don Boltz WB4IGK, 121 Fox Trail Dr., North Augusta SC 29841,* for the Sat. exams only. Pay for Sun. exam at test time. Failed Sat. applicants may take the Sun. exam.

BOXBORO MA The New England ARRL convention at Boxboro, sponsored by the Federation of Eastern Massachusetts Amateur Radio Associations, will be held at the Sheraton Boxboro Hotel on the intersection of RTE 495 & 111. Flea Market opens at 8 AM. Convention at 9 AM. Entertainment and YL programs. Exams both days. 2 M Fox Hunt. Talk-in on 2 M–146.61, 146.82, 223.94, 449.925 and Boxboro repeater 146.67. For info call *W1THT, (617) 284–1024.*

WEST PALM BEACH, FL The Palm Beach Repeater Assoc. will hold their Fourth Annual Palm Beach County Hamfest/Computer Show at the South Florida Fairgrounds. RV sites. Admission $4 advance, $5 at the door. 10' x 15' booth $45. 10' x 10' booth $30. Bring your own tables, chairs, table cloths and extension cables, or pre-register for tables @ $10, chairs @ $1.50. Make checks payable and mail to: *PBRA Hamfest, PO Box 461, Lake Worth FL 33460.* Talk-in on 147.765/.165. Contact *Hal Gainen N4UIT, Vending Committee, 6332 Tall Cypress Cir., Lake Worth FL 33463. (407) 439–0805.*

OCT 13

WEST FRIENDSHIP, MD The Columbia ARA, Inc., will hold its 14th Annual CARA Hamfest at the Howard County Fairgrounds from 8 AM–3:30 PM. General admission $5, unlicensed spouses and children free. Tailgating $10 per space (includes 1 general admission per space). Call *(301) 997–5052.* Tables, 1–4 @ $20 each, 5 or more $18 each (includes 1 vendor admission per table). Talk-in on 146.52 simplex and 147.735/.135 crosslinked to 222.32/223.92. For info and reservations contact *C.R. Whetstone WA3YOH, c/o CARA, PO Box 911, Columbia MD 21044.* After Sept. 20, before mailing anything, call *(301) 486–2609, (301) 765–7918,* or to leave messages, *(301) 997–5052.*

SHELBY TOWNSHIP, MI The Utica-Shelby Emergency Communications Assoc. ARC will hold a Swap & Shop from 8 AM–2 PM at the Eisenhower High School at 6500 25 Mile Road. Advance tickets $2, $4 at the door. 6' tables $10. Trunk sales $5. Talk-in on 147.18+ and CB CH 34. Send payment and SASE to *Arpad R. Miklos WY8M, 3180 Chard, Warren MI 48092. (313) 751–3804.*

WAUKESHA, WI The Kettle Moraine RAC Inc. will hold its 12th Annual Ham/Computer Swapfest at the Waukesha County Exposition Center, Hwys J & FT, from 8 AM–1 PM. Set-up at 6 AM. Tickets are $4 advance, $5 at the door. Reserved tables $5 for each 4' length. Admission ticket required. Reserve before Oct. 6. Exams by Badger Examiners. Send SASE, check payable to *KMRA Swapfest, PO Box 276, Waukesha WI 53187-0276.*

OCT 19

VERONA, NY The Madison-Oneida ARC will hold VE Exams at the Madison-Oneida BOCES on Spring Road beginning at 7 PM. All exams offered. Technician through Extra cost is $4.95. Talk-in on 145.37. Contact VE *Leonard Popyack WF2V, (315) 853–8974, or on 146.79, 145.37, WF2V @ WA2TVE, or POPYACK@TOPS20.RADC.AF.MIL.*

OCT 19–21

EL PASO, TX The Third Annual HAMFIESTA will be co-sponsored by the El Paso ARC, Sun City ARC, West Texas Repeater Assoc., Bilingual ARC, and Chapter 84 QCWA. This is an international affair in co-operation with Mexico, which will allow Americans attending the HAMFIESTA to enjoy shops, hotels and the race track in Juarez, Mexico. For info contact *W.J. Deragisch, 301 Ridgemont Drive, El Paso TX 79912-5330. (915) 584–1649.*

OCT 20

SELMA, NC The Triangle East ARA will hold its Second annual ARRL sanctioned Hamfest at the Smithfield Moose Lodge from 8:30 AM–3:30 PM. Set-up at 6:45 AM. Admission: Adults $4 in advance, $5 at the door. Children under 12 free. Inside table and two chairs $6. Outside space $3. Pre-registration required for VE Exams. Send $4.95 and completed 610 to *TEARA Hamfest, c/o Vince Yakamavich, AA4MY, 220 Carriage Trail, Raleigh NC 27614. (919) 847–8512* (evenings 7–9).

GRAY, TN The 10th Annual Tri-Cities Hamfest will be held at the Appalachian Fair Grounds. Sponsors are the Kingsport, Bristol and Johnson City Radio Clubs. RV hookups. Admission $5. Mail inquiries to *PO Box 3682 CRS, Johnson City TN 37602.*

GREENWOOD, NOVA SCOTIA The Greenwood ARC, VE1WN, will hold their Second Annual Ham Fleamarket from 9 AM–3 PM at Gilwell Hall. Admission is $2. Talk-in on 146.52 and 146.07/.67 MHz. Contact *Lance Peterson VE1VCL, Greenwood ARC, PO Box 63, Greenwood Nova Scotia, Canada B0P 1N0.*

OCT 21

STIRLING, NJ The Tri-County Radio Assoc. will hold a Hamfest/Flea Market from 8 AM–2 PM. Take Valley Rd. to Passaic Township Community Center. Admission $3, children under 12 free (with parent). Limited reserved tailgating. Wheelchair accessible. Tables $8; with AC, $10. Talk-in on 147.255/.855, 146.52. For reservations: *Dick Franklin W2EUF, 23 Shawnee Road, Cranford NJ 07016. (201) 276–6522.*

CENTRALIA, IL The Centralia Wireless Assoc., Inc., will hold its annual Hamfest at the Kaskaskia College Gymnasium beginning at 8 AM. Set-up at 7 AM. Flea Market space (including one table), $5. Free parking. Admission/Prize tickets $2 each or 3/$5. Talk-in on 147.27/.87 and 443.2/448.2. Mail ticket orders with an SASE to *Centralia Wireless Assoc., Inc., Hamfest Tickets, PO Box 1166, Centralia IL 62801.* For info call *Bud King WA9U, (618) 532–6606,* or write to *CWA, Inc.* at the above address.

BENSALEM, PA The Penn Wireless Assoc. will sponsor Tradefest '90 at the Yezzi Athletic Field beginning at 8 AM. Set-up at 6:30 AM. Admission $3, $7 per carload. Kids 12 and under free. Spaces $5. Multiple spaces guaranteed by advance payment. VE Exams. Tailgating. Talk-in on 146.52 and 146.925/.325. Send checks with SASE to *PWA Tradefest '90, PO Box L-734, Langhorne PA 19047.* For info call *Steve at (215) 752–1202.*

OCT 27

BROOKLYN PARK, MN The Sixth annual Hamfest Minnesota & Computer Expo will be held at the Hennepin Technical College from 7:30 AM–3 PM. Admission $4.50 advance, $6 on the day of the show. VE Exams, no walk-ins. Pre-register by sending SASE, completed 610 form, photocopies of current license and code credit plus $4.95 (payable to ARRL-VEC) to: *VE Exams, Jerry Jensen WT0W, 10900 Ewing Ave. S., Bloomington MN 55431. (612) 888–6187.* Fleamarket tables, main area, $18 each, set-up 6:30 AM. 2nd floor, full table $12 each, set-up 7 AM. Hallway, full table $6 each, set-up 7 AM. Hallway, half table, $6. each. You must have an admission ticket to display in the fleamarket area. Maximum of 4 tables per seller in main area. No limit in other areas. Send SASE with check payable to *Hamfest Minnesota & Computer Expo,* to: *Hamfest Minnesota & Computer Expo, Box 5598, Hopkins MN 55343.*

OCT 28

CROMWELL, CT The Middlesex ARS/Connecticut AR Emergency Service, with the Cromwell Middle School ARC, will hold a Hamfest at the Cromwell Middle School beginning at 9 AM. Set-up at 7 AM. Donation $4 adults, under 12 free. VE Exams info: *Ed Kerns KN9Y (203) 342–4300.* Talk-in on 147.09/.69, 444.625/449.625. FM simplex: 146.52 MHz. For general info: *Jack Chapman WA1K, (203) 347–8745 or (203) 347–1134; Brian Battles WA1YUA, (203) 666–1541 or (203) CALL–YUA.* For table reservations call *Jack WA1K at the above numbers,* or *Kathy Allison KA1RWY, (203) 742–7727).*

SPECIAL EVENT STATIONS

OCT 6–7

COLUMBUS, OH The Columbus ARA will operate Station W8TO in conjunction with the Columbus USA Festival. The festival salutes the City of Columbus and the Explorer Christopher Columbus. Time: Sat. 0000Z–2400Z Sun. W8TO will operate SSB at the festival from Sat. 1500Z–0300Z Sun., and from 1500Z–2400Z Sun. Frequencies: 7.240, 14.340, 21.375, 28.500 MHz (all frequencies ±10 kHz). Exchange name, QTH and signal report. Commemorative QSL to all who confirm W8TO contact and all SWLs who confirm hearing W8TO. Certificates to stations who contact, and SWLs who hear, at least 10 Columbus stations. Working W8TO equals six contacts; each band counts separately. Plaque awarded to the station that contacts the most Columbus stations. Address for QSL and Log submission: *Roger Dzwonczyk WB2EIG, 283 East Longview Ave., Columbus OH 43202, USA.* Send an SASE ($1 postage or 1 IRC) for QSL and certificate. Use 9" x 12" envelope for unfolded certificate. Otherwise use #10 envelope.

OCT 13

BOY SCOUT CAMPOREE STATION The Lockheed ARC and the West Valley ARA, in conjunction with the Santa Clara County Council, will operate Station WA6GFY from 10 AM–5 PM PDT, to introduce Amateur Radio to the 5,000+ Boy Scouts who will be participating in the Camporee. Frequencies: 14.23, 21.35, 38.4 MHz. Send a 9 x 12 SASE to: *Brian Davis KJ6WH, 3461 Fawn Dr., San Jose CA 95124.*

OCT 13–14

HARLINGEN, TX The South Texas ARS and the CAF Ghost Squadron, will operate Station N5CAF Sat. and Sun. from 9 AM–8 PM local time, to celebrate the Confederate Air Force Annual Air Show. Attempts will be made to contact several of the WWII aircraft in the CAF inventory. Listen for B-29, B-17, B-25, P-51, P-40, etc. Frequencies: SSB 14260, 21260, 28460 kHz. For special QSL photo of the B-25, send your QSL and SASE to *Dr. David Woolweaver K5RAV, 2210 S. 77 Sunshine Strip, Harlingen TX 78550.*

OCT 17–19

NEW YORK, NY The Radio Club of Junior High School 22 will operate WB2JKJ daily from 1100–1900 UTC to commemorate the 10th Anniversary of the Club, and Education thru Communication. Frequencies: 7.238 and 21.395 MHz. For an outrageous card, contacts and SWLs may QSL to: *The 22 Crew, PO Box 1052, New York, NY 10002.*

OCT 31–NOV 1

FRANKENSTEIN, MO The Mid-MO ARC will operate WOØO from 2100Z Wed.–1400Z Thur. in celebration of Halloween. Frequencies: 35 kHz up from the bottom of the CW, Novice, and General phone subbands. For certificate, send QSL and SASE to *Jeff Kunce NØJUH, 1213 E. Dunklin, Jefferson City MO 65101.*

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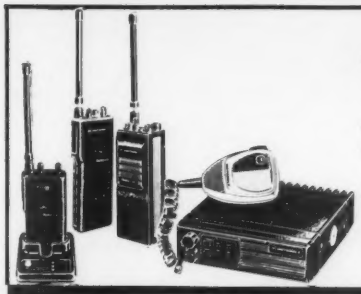

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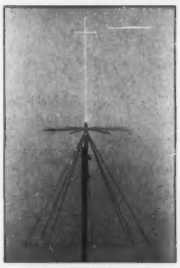

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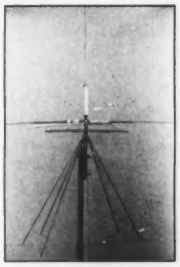

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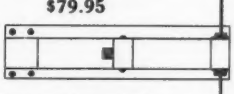

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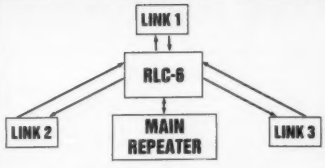

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edited by C.C.C.

Arnie Johnson N1BAC
103 Old Homestead Hwy.
N. Swanzey, NH 03431

Notes from FN42

More sad news. Peter Strauss ZS6ET, 73's Hambassador to the Republic of South Africa, died in a light plane accident on July 30. According to a quick FAX from Phil Gray KA7TWQ, Hambassador for Mozambique, a message from an SARL representative said that Peter was apparently taking a test for his pilot's license when he was forced to take off after landing and crashed in the process. Peter was also a Councillor for the South African Radio League.

With the death several months ago of Ken Gott VK3AKU, Hambassador from Australia and Awards Manager for the WIA, this leaves another hole in our 73 representation. Peter and Ken were two of our most prolific correspondents, and we will miss both of them. See the South Africa portion of this column for Peter's last report.

Limon, Colorado: In last month's column, I wrote about the tornado hitting Limon, stating that the news reports did not mention ham involvement. I've received some responses about the "Limon Disaster," as it is now called in Colorado. One person believed I was saying that local hams were not prepared for or involved in the emergency. Careful reading shows that I was asking questions, not making statements. I just didn't know whether hams were involved or not, and I asked for information. The major TV networks, CNN, and wire-service reports did not mention hams at all.

The responses I received from hams advised me that they were the first to report the tornado to others outside the area, and that they took a very active part in disaster communications. Bravo! But I heard nothing of these facts on the East Coast. I just wish that the national TV networks and wire-services had been informed of ham involvement, or if they were informed, that they had broadcasted this information.

Edie Sheffield KA0MQA, Section Manager of the ARRL for Colorado, wrote me about the massive effort hams played in the Limon Disaster (see "Roundup," below). THEY PLANNED, THEY PREPARED, AND THEY WERE READY!

Checking The ARRL Repeater Directory, *I discovered that there are two 2-meter repeaters located in Genoa, just east of Limon. No slight intended to the owners and users of those repeaters. Again, the only statement I made was that ham involvement didn't make the national news.*

—Arnie N1BAC

Roundup

Japan From *The JARL News*. According to an investigation by the Ministry of Posts and Communications, amateur radio stations totalled an amazing 1,027,101 as of March 31, 1990, passing the million mark for the first time. In March 1970, the total was 100,000. Compared to last year, the rate of increase was 12%. 110,000 new amateur radio stations went on the air, the largest increase ever.

Sweden From *Radio Sweden*. Arthur Cushen has updated his book, *Radio Listeners Guide*, from 1988 to a new 1990 edition. The new edition includes coverage of New Zealand's new shortwave service, Printer Disabled Radio, New Zealand and Australian medium wave stations revisited, and updated information on sunspots, jamming, world time, and pirate radio.

You can order this 116-page book (in A4 format) from Gilfer Shortwave, Box 239, Park Ridge NJ 07656, USA. Cost is $18 U.S. In Australia and New Zealand, you can order from Arthur Cushen Publications, 212 Earn St., Invercargill, New Zealand. Cost is 22 Australian dollars or 24.20 New Zealand dollars.

USA/Colorado From Edie Sheffield KA0MQA, on AMATEUR RADIO AND THE LIMON, COLORADO, TORNADO (edited for space).

During the evening of June 6th, a devastating tornado swept through Limon, Colorado, and virtually destroyed all communication.... The Severe Weather Net (SW) spotters had been tracking the storms since 1 p.m. with nets in both Denver and the Colorado Springs areas.

Trained amateur radio weather spotters were covering the possible danger areas, and Tim Samaras WJ0G, with his ATV camera, sent live pictures back to the National Weather Service in Denver. After Limon radar was knocked out by the tornado, the spotters provided the early reports and locations of several other tornados.

Limon is about 75 miles from Denver and just a bit closer to Colorado Springs. Pete Peterson N0AFR from Arriba was the first amateur on the scene, less than 30 minutes after the tornado hit, closely followed by Norm Michaels KA0EFF from Flagler. [The latter is] the EC (Emergency Coordinator) for Lincoln, Kit Carson, and Cheyenne counties. Other early arriving eastern plains hams included Buck Rodgers WA0DGJ and Keith Bowhan W0DGM of Genoa, and George Saum K0GS of Agate.

The Rocky Mountain Division Vice Director, Bill Sheffield KQ0J was alerted by David Richendifer WD0HNQ that the Colorado State Patrol was requesting Amateur Radio operators in Limon. Bill alerted the Emergency Coordinators of Denver, Jeff Irvin KB0CHT and Mike Stansberry K0TER of Colorado Springs, and within an hour of the tornado, amateurs were en route to Limon from Denver and Colorado Springs.

During the first hours following the tornado, amateur radio operators handled priority messages for the Limon Police, the Lincoln County Sheriff, the Colorado State Patrol, and other fire and rescue groups; amateur radio communications were set up at both the Mile Hi Red Cross and the Pikes Peak Red Cross around the clock, providing emergency and health and welfare communications in and out of the area.

The second day a fresh batch of amateurs arrived at Limon, including Bob Ragain WB4ETT, DEC, Jim Lommen KC7QY, EC for Arapahoe County, and Bob Hitchens K8VQC, EC for Douglas County. By Friday, June 8th, priority communications were winding down and the amateur radio operators were concentrating on health and welfare traffic along with coordinating communications for the Red Cross, Salvation Army, and the NWS radar station in Limon.

The Pikes Peak 2 meter repeater W0YNE was the only usable repeater from Limon. The Hugo repeater went out with the storm and Denver repeaters and other Colorado Springs repeaters were not reachable. Mike K0TER tried to coordinate packet, but the distance was too great for the COS digi to work effectively, so health and welfare traffic was passed on HF and 450 MHz along with 2 meters.

The following is a partial listing of some of the amateurs involved during this communications effort.
N0AFR, N0AMP, N0BQH, N0CYR, N0DWT, N5EZL, N0FDA, N0IER, N0IEM, N0IKF, N0ION, N0IZQ, N0KIC, N0KRW, N0JAA, N0JLH, N0LBI, W0BEG, W0DGM, W0DUM, W3TMR, KG0S, KQ0J, KT0H, K0ZL, NX0E, NW0J, WG0N, WJ0G, WR0S, WU0N, W0VI, K4UBU, KC7QY, K8VQC, K0PGM, K0PGU, K0QBA, K0TER, K0WIQ, K0UEM, KC0TR, KD0NT, AL7GQ, KA3HBK, KA7EEJ, KA7JOR, KC4KGS, KA0EFF, KA0EFM, KA0JEA, KA0MQA, KB0ADH, KB0ADG, KB0CHT, KB0FNM, KD0UE, WB4ETT, WB6YXD, WA0DGJ, WD0HNQ, WA0MNL, WB0MPH, WA0TAV, WB0TUB, WA0ULE, WA0YNP.

There were so many amateurs involved from the Front Range of Colorado that it is difficult to have a complete list of all of their names and calls. But every amateur is to be commended for the excellent job done in this disaster. The distance traveled each day to provide the many man-hours of communications was a tremendous effort, and the services provided have shown to the public and to local and state officials the value of amateur radio and our capability for establishing and maintaining an effective emergency communications network within our own state of Colorado. *[Edie Sheffield, KA0MQA, 1444 Roslyn St., Denver CO 80220.]*

HONG KONG

Philip J. Weaver VS6CT
Flat 39C Two Park Towers
1 Kings Road
Hong Kong

Nearly a year has elapsed since I last wrote a note from Hong Kong. During that time I moved from the old flat I had been in for the last 13 years. I now reside on the top floor of a 39-story apartment block and it has taken me nearly a year to get the antennas in the photograph up and running, with the help of Brett VS6BG who shares with me. *[WOW! What a location!]*

Amateur activity in Hong Kong thrives and as of July we have 972 licensed amateurs in Hong Kong. 741 are Class "B" licenses, which was first introduced in April 1982, and 231 are Class "A" licenses. The majority of Class "B" holders are very active on 2 and 6 meters, and as such there has been considerable activity out of Hong Kong on 6 with quite a few firsts on 6 into Europe.

The Telecommunications section of the Post Office, which handles all amateur radio licensing in Hong Kong, has once again moved its offices. Now it's located on the 19th floor of the Sincere Building in Des Voeux Road Central in Hong Kong.

The issue of reciprocal and visitor's licenses are still as swift as always, and provided you come in with the right documentation, you can expect a call and receipt for the license fee (HK $150) to enable you to operate legally within 30 minutes. If you are not sure what is required or where to go, call me when you get into Hong Kong. Be sure that you bring your original license for the PMG people to see.

The Hong Kong Amateur Radio Transmitting Society (HARTS) still meets on the second Tuesday of every month at 1900 in the Volunteer Officers Mess on the 2nd floor of Beaconsfield House, next door to the Hilton Hotel. All guests are very welcome. The only other Society is the English Language Amateur Radio Transmitting Society (ELARCS), whose aim is to look after the interests of the expatriate community. It meets quarterly with a dinner, usually in one of Hong Kong's Yacht Clubs. For information call me on arrival at 887-6366, or write before you come and I can tell you when and where we shall next be meeting. Our annual dinner this year will probably be held about the 6th of December, and we would welcome any overseas visitors who may be in town.

I have had many inquiries as to what has happened to our 10 meter beacon which normally operates on 28.290. We had some bad luck on site and it is taking longer than expected to get it all up and running. However, the 6 meter beacon on 50.075 has been operating without a break for many years now. We hope that the 10 meter beacon will

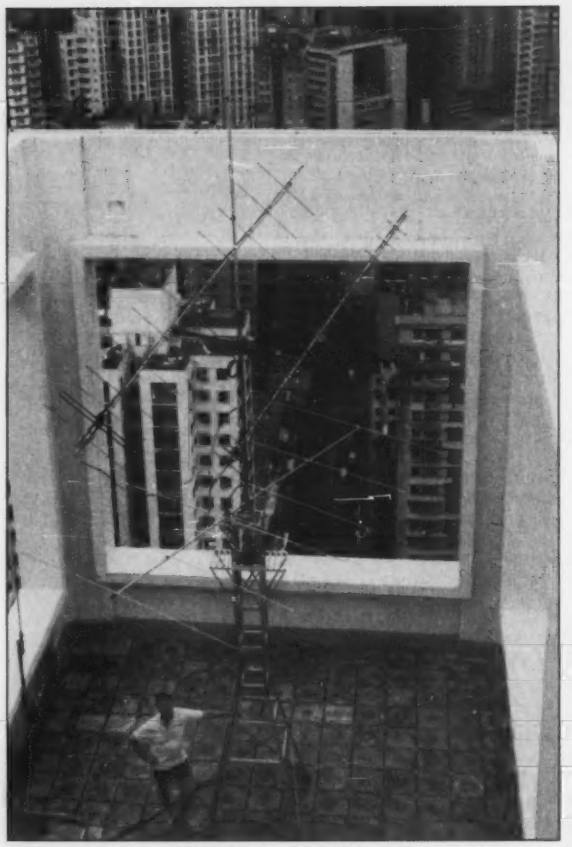


Photo A. Philip Weaver VS6CT and his antenna. He now lives on the top floor of a 39-story apartment block in Hong Kong.

be back on the air by the time this is printed. Hong Kong is one of the most frenetic cities in the world, and finding time after work and on the weekends to get other things done can be a problem.

At work I have been kept very busy getting the new satellite program up and running for the Cospas-Sarsat program. This is a very interesting sidelight to the use of NOAA low-orbiting satellites for the detection of transmissions from Emergency Position Indicator Radio Beacons (EPIRBs). Hong Kong has established the first Local User Terminal in the Far East, and as Search Coordinator for the South China Sea it is part of my section. Plus we are investigating the procurement of the necessary radio equipment for communicating with ships at sea under the Global Maritime Distress and Safety System (GMDSS) which will be implemented in February 1992.

There are now four 2-meter repeaters operating in Hong Kong, although only one, provided by ELARCS, uses the English language. If you want to get on the air with this one, you will need a CTCSS encoder/decoder on your radio. Call me for the code when you get here.

Until later, 73 de VS6CT, Philip Weaver. *[Philip's antennas in the photo are a 6 meter beam, 144/430 beams for satellites, and a Cushcraft R5 vertical for HF on the top.]*

LITHUANIA

Jonas Paskauskas LY2ZZ
PO Box 71
Siauliai 235400
Lithuania

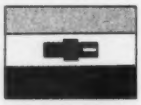
The Lithuanian Amateur Radio Conference, which was canceled this year because of the political situation, has been rescheduled and will take place in June 1991. All problems with Visa applications should be straightened out by the end of this year. Anyone interested in attending this conference should contact me at the above address or on the World Lithuanian Amateur Radio Net meeting on weekends on 28.444 or 21.330 MHz at 1400–1500 UTC.

The first portable LY callsign, LY/W1ECK, was issued this spring to W1ECK as he was visiting Lithuania. Also, another portable LY callsign, LY/DL9HQ, was issued.

Any amateur planning a visit to Lithuania and wishing to obtain a portable callsign should send a copy of his license to me with the dates of the planned visit.

News from Latvia: I was told that YL portable callsigns are also being issued. To obtain them, write to The Minister of Communications, Riga, Latvia, and enclose a copy of your amateur radio license.

That's all from Lithuania at the moment. I hope to see many of you at the Conference in June.



SOUTH AFRICA

Peter Strauss ZS6ET
PO Box 35461
Northcliff
ZA-2115
Republic of South Africa
"Silent Key"

The new South African radio amateur novice licence became a reality for South Africa in June 1990. Negotiations between the administration and the South African Radio League started in 1989. A proposal outlining the framework for the new licence grade and suggested frequency ranges had been presented by the SARL negotiating team directly to the Postmaster General and senior officials of the licence authority.

South African radio amateurs had until recently only two licence grades: A—full (all privileges included) ZS licence requiring a technical, multiple choice exam and 12 words per minute Morse test, and a restricted ZR licence of the same technical exam level, but without any Morse test. The introduction of the restricted licence (no code licence) more than 20 years ago as a second licence class maintained compatibility with the licence grades in most of Europe and the Far East (except, e.g., Japan and the USA).

Today, tremendous progress has been made in the arena of international licence compatibility. Many member countries of CEPT, an umbrella organisation of European Telecommunications Authorities, no longer require written applications from foreign radio amateurs of signatory countries, and they permit mobile and portable amateur operation by means of a global multilateral operating agreement.

The third licence grade introduced in South Africa is not CEPT-compatible in many aspects, but aimed to promote electronics and telecommunications in a wide sense amongst young people. The 5 words per minute has been introduced in order to comply with the International Telecommunications Union (ITU) requirement that radio amateurs intending to operate below 30 MHz must be able to send and receive Morse code. The speed is left to the individual administration. The new licence reduced the minimum entrance age from 16 to 12 years. It was experienced that the age limit posed a problem in particular at a time when scholars were preparing for University entrance exams or high school final exams. This resulted often in opposition from parents who perceived the radio amateur exam as a "distraction" to their children.

In order to make the new licence attractive to the potential radio amateur, significant frequencies and operating modes have been included. Voice communication and data communications in the 70cm band provide access to the worldwide packet BBS network and local communications. Voice communication via an allocation on the 10 meter band encourages experimentation with antennae and home-brewing by converting CB radios and modifying CB antennas, etc., at very little cost. Regional communication via CW and data (RTTY and PACKET) in the 10 MHz band will permit the Novices in South Africa to communicate across the borders.

In order to implement the main objectives (low entry age, easy technical exam and HF slices) concessions regarding the permissible output power had to be made *[5 watts modulation and 20 watts PEP]*. The resultant licence structure may be a model for many other developing countries intending to make a serious effort in the promotion of amateur radio. US amateurs should not forget that there are still many countries in Africa with only one licence grade, dating back to colonial days, effectively excluding local nationals from the amateur service in these countries.

The new South African Novice

Photo B. Tracy Strauss, enrolled for the new South African Novice licence, gets a feel of the keyboard for a future packet contact.

licence will provide an entry to the amateur service to all population groups and an opportunity to find an interest in electronics as a vocation in later life. By the time you read these lines you may well want to keep a lookout for the new ZU1 callsign prefix allocated to the South African Novices.

Enclosed is a photo of Tracy, Susan's and my daughter. She is enrolled for the Novice license and is getting a feel of the keyboard in preparation for packet radio. *[Peter enclosed the main features of the new licence but there is not room here to print them. Look for them on the 73 BBS. Frequencies on which a Novice may transmit are portions of: 160m, 80m, 30m, 15m, 10m, and 70cm, with differing modes of transmission.]*

SPAIN

Woodson Gannaway N5KVB/EA
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de Gran Canaria)
Islas Canarias
Spain

Good news for four of the members of Union de Radioaficionados Las Palmas (URL) in the Canary Islands. They were advised that they had won their class in the Associazione Radioamatori Italiani (ARI) International DX Contest.

The four contesters are all active members of the URL. Elsa EA8BVH has been an ameteur since September 1988, and in this short time she has won almost every Spanish contest in which she has participated. She has also won the Canary Island of Africa part of most of the foreign contests she has participated in.

Isabel EA8BSJ has been an active amateur since 1985 and a successful contender from the first. But since 1988 she has sat out the contests in order to help Elsa develop, sharing her experience in all areas of contesting. She is also working on a book about worldwide contesting.

Marcos EA8BIK is the URL Secretary and an active planner and participant for all kinds of activities. He is also a good contest operator. In this contest he took care of attendance.

Leon EA8BSI teaches electricity and electronics at the URL. He is also a good contester (in the last ARRL contest he logged 2,940 contacts in 48 hours). In this contest he handled the antennas, equipment, and the kitchen.

A future story that I am trying to chase down are the plans of a commemorative sailing of Columbus's three little ships that sailed to the United States of America about 500 years ago. The sailing will be in 1992, and I understand that things are starting to happen. If anybody in Spain has any information, please send it to me.

Congratulations to the contesters and best wishes to all! 73 de Woodson, N5KVB/EA. 73

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UPDATES

July QRP

I noticed an error with the schematic in the "QRP" section in the July 1990 issue. This error will blow the fuse each time power is applied. You cannot wire the secondary of a transformer in that manner to get more current. If you want to get more current, you need two identical secondary windings, and you must phase them so that they don't fight with each other (see the corrected portion of the schematic below).

Also, the author noted that he "...wired both 14.8 volt secondaries in parallel. This increased the current to the bridge...and the extra current helped keep the voltage stable under load." That would be true HAD he wired the secondaries in parallel. But he noted earlier that "...14.8 volts was a bit low for the regulator," and he is correct in that most voltage regulators require at least 5 volts differential. *TNX Glen Closson N6PQP.*

Field-Strength Meter

Ray Kent KM4KT, the author of "Quick and Easy Field-Strength Meter" in the September 1990 issue of *73*, notes that for greater sensitivity, you can eliminate R1. *TNX KM4KT.*

Portable 100 BBS

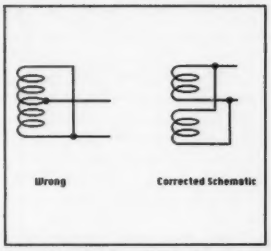
See the letters column in the August issue. The phone number for the *Portable 100* BBS should be (603) 924–9770. *TNX Nuge.*

June Ham Profiles

From Joel Mendes Pinto PT2KU: "Thanks for the note my friend Gil AL7KU sent you about our eyeball QSO in my QTH in the June issue.

"There is a little correction which is very important to me: The design of T-shirts was for the first 2m group in Brasília (the capitol), not Brazil. Also, in 1975 I set up the first 2m station in Brasília, not Brazil.

"Many hams from São Paulo, Rio de Janeiro, and other cities, were the true pioneers years ago, on 2m works." *TNX PT2KU.* 73



Correction for the QRP schematic in the July 1990 issue.

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HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. Use upper- and lower-case let- ters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Thank you for your cooperation.

Blind, handicapped, house-bound ham with arthritis for 20 years wants to hear from people, and seeks a portable shortwave radio, such as a Sony Model 2010. If you could help me, please write or phone. I welcome letters. *Richard Jastrow. 5909 W. 6th St., Los Angeles CA 90036, phone (213) 938–5347.*

Looking for Teletype Bulletins 120B, 1167, 251B, and 254B. *Charles T. Huth, 229 Melmore St., Tiffin OH 44883. (419) 448–0007.*

I need a schematic or manual on RF Communications, Inc. HF Transceiver Model RF-301, made in the USA 20 years ago. I will copy and pay all postage. *Jesus Gonzalez CO2DC, Box 6681, Havana 6, Cuba.*

I am in need of information concerning construction of a Jacob's Ladder. A friend of mine at work wants to build one for a science project with his son. Thanks for any help. *Eric Johnson KM4ZL, 105 Kentwood Dr., Daphne AL 36526.*

I am interested in packet radio, especially TCP/IP (snmtp) but am having a heck of a time getting going. I am interested in setting up equipment, donating time and money and working with others to set up a reliable high speed digital backbone. Anyone else interested? Let's do it. *Tommy B, (309) 888–4184 or wd8eib@wd8drm.il.usa.na.*

I would like to hear from anyone who has any programs regarding amateur radio for the Atari 800 or 800 XL computer. *Greg Lotoczky, PO Box 4412, Centerline MI 48015.*

Needed: Technical manual or any other description of Hallicrafters type HLA-KA amplifier. *Rag Otterstad OZ8RO, Vejdammen 5, DK-2840 Holte, Denmark.*

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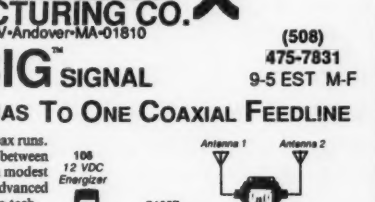

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New "Hamsat" in Orbit

On July 16th of this year, Pakistan joined the ranks of those countries with satellites transmitting within the amateur bands. Launched on a Chinese Long March rocket, BADR-1 was lofted into a low-inclination elliptical orbit. Many stations were surprised when UoSAT-type data was heard unexpectedly on 145.825 MHz FM.

Early information from Dr. Martin Sweeting at the University of Surrey in England indicated that the satellite was sponsored by SUPARCO, the Pakistani Space and Upper Atmosphere Research Commission. The orbit has a perigee (low point) only 200 km up, while the apogee (high point) of the orbit is nearly 800 km. It is not known if the satellite builders expected this orbit—the low perigee will limit the lifetime in orbit to about six months before the satellite's fiery re-entry.

During the first two days of life in orbit, BADR-1 telemetry on 145.825 MHz sounded like UoSAT-OSCAR-11, but the data was apparently unintelligible—repeating HEX numbers at 1200 baud using tones similar to the Bell 202 standard. Later only a single 2200 Hz tone with no apparent data was monitored on the downlink. The satellite has also been heard on 144.028 MHz.

Dr. Abdul Majid of SUPARCO reports that BADR-1 is well and is undergoing tests. He expected full operation including digital communication experiments by early August. Orbital-element information is available from AMSAT nets and packet radio news releases for use with commonly available computer tracking software.

The Decay of A-O-13

Earlier this year, Victor Kudielka OE1VKW published an article in *AMSAT DL Journal* from West Germany concerning premature decay of the orbit of AMSAT-OSCAR 13. Subsequent studies here in the U.S. and overseas yielded wildly divergent estimates on the date for A-O-13's demise, ranging from 1992 to 1997. Most hams found it hard to believe that an orbit with a perigee of 2500 km like A-O-13's would ever decay.

A statement from Dr. Karl Meinzer DJ4ZC, one of A-O-13's designers and President of AMSAT DL, pointed out that elliptic orbits with high inclinations are potentially unstable due to the gravitational effects of the sun and moon. The Soviets discovered this years ago when some of their Molnija satellites (in high elliptic orbits) prematurely re-entered the atmosphere because of these effects.

Prior to the launch of A-O-13, AMSAT was aware that the orbit could be unstable so they increased the perigee from the target value of 1500 km to 2500 km during the second orbit-adjustment kick-motor firing early in the satellite's life. This was done to provide an extra margin of safety to the orbit. Since then, the perigee has been declining faster and farther than anticipated, currently losing nearly a kilometer per orbit.

The new studies show that the original calculations were either too coarse or that the slight changes of the moon's orbit adversely affected A-O-13's orbit, but all the news is not bad. Current estimates show that A-O-13 will experience a perigee low around 500 km in July 1992. The perigee will rise to about 750 km in November 1993 and re-entry is not expected until 1996 or later. The satellite's batteries or other critical components could fail due to age and the rigors of space before its toasty end in the atmosphere. Details on the orbital studies will be presented in Houston, Texas, at the Johnson Space Flight Center on October 20, 1990, during the AMSAT Annual Meeting and Space Symposium. Contact AMSAT at (301) 589-6062 if you would like to attend.

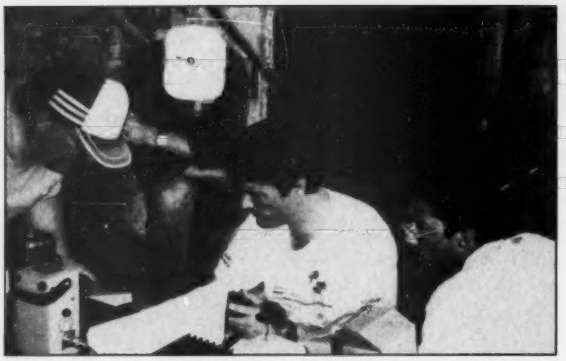

Photo A. Field Day 1990: WA5ZIB at the satellite station while WA5LHM, WB5HLZ and Greg Rice watch.

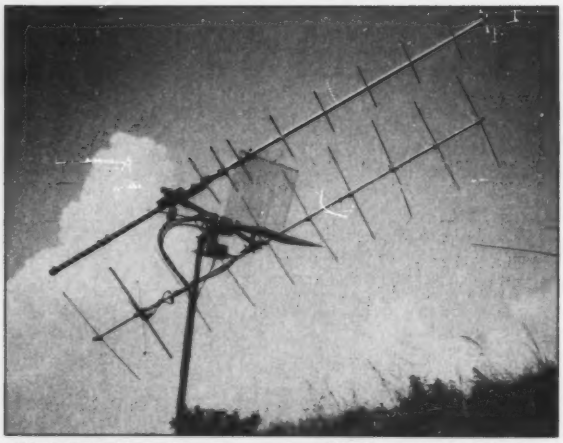

Photo B. Field Day hamsat antennas at N5EM—simple but effective.

Satellites are a limited resource. Work is already underway for Phase 3D (an upgraded version of A-O-13) in West Germany. Launch is expected before 1996.

DOVE—On Again, Off Again

AMSAT engineers made great strides toward the recovery of DOVE-OSCAR-17 during July. While it was hoped that the satellite would be talking by late June, curious software crashes plagued the efforts. Dr. Bob McGwier N4HY determined that the main difficulty was due to a hardware problem within the satellite.

During software uploads to DOVE, data was being correctly received but acknowledgment packets from the onboard computer were not being transmitted back to Earth by the S-band transmitter. Bob and Harold Price NK6K have tailored their software to work around this problem.

When DOVE was heard on 145.825 MHz in late July, listeners hoped that full recovery was at hand. It was not. DOVE again became silent just a few days later. This time the problem was simply incorrect commands from the ground.

Since the almost-fatal system crash in March when the 2-meter transmitter was locked on, a "watchdog" timer has been incorporated into the software. If the satellite does not receive the proper commands from a control station within three days, the 2 meter transmitter is turned off and the satellite goes into a "safe" mode where only the S-band transmitter is energized.

DOVE never received the proper timer reset commands, so it shut down. This hamsat and the other Microsats are complex devices. Troubleshooting them on a bench in a lab would be difficult. Solving problems and doing diagnostics with the patient circling the Earth hundreds of miles up makes the situation even more exasperating and challenging. The AMSAT-NA Microsat team has demonstrated remarkable creativity and ingenuity as they work toward fully functional Microsats in orbit.

Field Day 1990

Last month I focused on portable and mobile RS-10 Mode A (2 meters up and 10 meters down) activity. Field Day was the perfect opportunity to try out portable systems. Our own group in South Texas at the Fort Travis Sea-

Photo C. Setting up for OSCAR activity at a Boy Scout Camporee in Texas. (Photo by N5DIB.)

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CIRCLE 332 ON READER SERVICE CARD

Photo D. KE5SR (far left) helps scouts make contacts via 2 meters, prior to tuning in A-O-13. (Photo by N5DIB.)

shore Park on Bolivar Peninsula near Galveston did just that. With a basic array of Cushcraft antennas and various rigs, including a Yaesu FT-726R and a Yaesu FT-736R, we had many enjoyable contacts through AMSAT-OSCAR 10, A-O-13 and RS-10. Fuji-OSCAR 20 was not available for Mode JA (2 meters up and 70 cm down) analog activity and we did not have any digital equipment beyond the simple packet system for 2 meter terrestrial work. The Mode B (70 cm up and 2 meters down) transponder on A-O-13 sounded like 20 meters during a DX contest.

The Mode L (23 cm up and 70 cm down) transmit system at our location was not sufficient for any QSOs via the satellite, but it did provide a nice ATV contact on 1289 MHz with NI5I across the bay. Last year we had a four-foot dish with a circularly-polarized feedhorn and 35 watts through 20 feet of Belden 9913 coax. This year, the power was the same but the feedline was longer and the antenna was a linearly-polarized modified corner reflector. Less antenna gain and more transmission line losses added up to no contacts. Next year will be different. We'll be using a combination 1.2/2.4 GHz feed system and a six-foot dish.

There are other opportunities during the year for portable activity. Many Boy Scout camporees and demonstrations provide an excellent environment for experimenting and demonstrating satellite operation with simple systems.

Bob Schaer N5DIB got Scouts involved with 2 meter and 70 cm satellite antenna construction. They used wooden tent poles lashed together for the mount and adjusted the elevation while monitoring a simple Sears inclinometer and checking azimuth with a Boy Scout issue compass. Keeping the antennas just clear of the ground during pointing is all that is required for hamsat contacts when the path to the sky and the desired satellite is clear. With today's solid-state radios, a large car or deep-cycle battery can run everything.

Even less is required for RS-10 activity via Mode A. A simple omni antenna for the 2 meter uplink and a dipole for the 10 meter downlink takes care of the antennas, while a multimode 2 meter transceiver and an HF rig cover the equipment needs.

Check last month's "Hamsats" for details on simple but effective installations. 73

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Digital Dithers

Does the word "confused" mean anything to you? How about "befuddled" or "frustrated?" If not, you may never have been in the position of an amateur venturing into digital communications for the first time.

Let me take a case in point. I just received a letter from Curtis L. Shiffer WD0ELK of Des Moines, Iowa, which kind of sums things up. Curtis writes:

I built a terminal unit for RTTY several years ago, but [it] was very hard to tune in RTTY, and [I] never got it to receive. I purchased an MFJ-1274 about a year ago. I can receive OK if I tune properly, and know where to look for RTTY. I am not real up on this mode. I have never been able to transmit with [the] MFJ-1274.

I am using a Swan 700CX. I double-checked the cabling to the radio and computer. Does the timing on tube transmitters give a problem on transmit? Also, I would like to get on AMTOR. Will the Swan work on AMTOR, and do I need another software program? I am using a C-64 computer. . . .

I was told by a dealer that if I got a software program for AMTOR, I would also have to get a newer, solid state, transmitter. If so, I would like to know what other hams are using for RTTY and AMTOR.

I also have [another] MFJ-1274 that I use with another C-64 on packet, with an ICOM 2AT. It works OK on transmit and receive into W0AK club station and the KC0KZ BBS.

Controllers

First marketed about three or four years ago, the MFJ-1274 was one of the first high quality packet controllers on the market. A clone of the TAPR TNC-2, this commercial unit took the bare board, cleaned it up a tad, and put it in a box, complete with power supply, serial port, battery backup, and an LED tuning indicator.

Able to run both VHF and HF protocols, this unit put packet in reach of anyone with a computer and a radio. Software programs were offered for the VIC-20, a very low cost (for 1987) computer, as well as the C-64. Further, the ability to use any ASCII controller, and promises of software updates, intimated a long life for the MFJ-1274.

But remember, this is a PACKET terminal unit, *not* a RTTY unit! You cannot tune in RTTY with this unit because it is looking for packet protocols, not five-level RTTY signals. Having covered this topic before in this column, I won't go into it again at this time. But if you need to look at the different signals available in the digital spectrum, don't be afraid to ask!

Transmitters for RTTY

Now, as to the question of the transmitter. Tube vs. solid state, that is the question, hmm? Well, not really. The real issue is, how fast can your transceiver, or transmitter and receiver, switch from receive to transmit, or from transmit to receive?

You see, when transmitting a mode like AMTOR, you need frequent, rapid transitions from receiving to transmitting and back. This is due to the need to acknowledge the little packets of characters as they are sent, in this error-correcting mode. Similarly, packet radio protocols require the receiver to send acknowledgment of a received packet. If your transmitter cannot come up on the air quickly enough, you may lose the communications link. That, in a nutshell, is the difficulty with older transmitters.

While going out and buying a new transmitter is wonderful if you have the money, it is not always necessary. You may be able to coerce the old transmitter on the air by reducing power, narrowing a relay gap, or changing the values of some of the switching components. If you ask around on the air, someone with a rig just like yours is sure to have faced whatever problem you have with it. I had such luck when I was looking for the cause of a relay hang-up in an old transmitter of mine.

Failing all that, sure, go out and buy a new solid state rig. Just don't tell your wife (mother, significant other) that I told you to do it!

Look Into It

I don't know if there is an upgrade for the MFJ-1274, to add other modes to it, but you might drop a line to MFJ Enterprises, Inc., at P.O. Box 494, Mississippi State, MS 39762; or call them at (601) 323-5869. Another question is whether you can trade the MFJ-1274 in on the newer MFJ-1278 multimode controller, which does all you want, and more! Of course, be sure to mention *73 Magazine's* "RTTY Loop" when you call.

As to the question of what computers other hams are using, every time I ask that one, I run out of paper trying to tally the response. I'm going to go out on a limb and say now that, from what I've heard and read, about half of the amateurs are using a MS-DOS or PC-DOS computer, about a quarter to a third are using one of the Commodore series (VIC-20, C-64, C-128), and the rest are scattered among Radio Shack CoCo's, TI 99/4s, Apples, Macs, and who knows what else.

As to radio equipment, most appear to be using modern HF solid state stations. I'd be interested in hearing about how many old clunkers are still on the air. I have an old phasing type SSB rig that I had on RTTY for many years. I liked it because it would run, key-down, for hours on end. Of course, the table began to sag under its weight after a couple of years!

One high tech note this month. I recently upgraded the computer at WA3AJR from the old 8088 to one a bit more speedy, and discovered that an interface board would not fit in the new computer. I don't know how prevalent this situation is, but I suspect as more amateurs move to higher power computers, this might become a problem. I have a letter out to the manufacturer, and I hope to report on the outcome next month. For now, I would be interested in hearing about any such incompatibilities, on a hardware or software level, from you all.

As you can see, we try to respond to your questions, wants, and needs in RTTY Loop. The territory we cover ranges from five level Baudot to five disk hard drives, with anything in between fair game. Let me hear from you, with your thoughts on this world of digital communication. Send mail to the address in the banner, or Email via CompuServe to ppn 75036,2501, or via Delphi to username MARCWA3AJR. I look forward to hearing from you. 73

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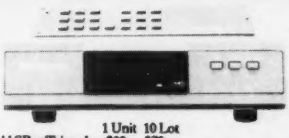

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- ☐AMSTERDAM ISLAND ... FT8
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- ☐ANDORRA ... C3
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- ☐ARMENIA ... UG
- ☐ARUBA ... P4
- ☐ASCENSION ISLAND ... ZD8
- ☐AUCKLAND ISLAND ... ZL4/A
- ☐AUSTRAL ISLANDS ... FO
- ☐AUSTRALIA ... VK
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- ☐AZORES ISLANDS ... CT2
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- ☐BANGLADESH ... S2
- ☐BARBADOS ... 8P6
- ☐BEAR ISLAND ... JW
- ☐BELGUIM ... ON
- ☐BELIZE ... V3
- ☐BENIN ... TY
- ☐BERMUDA ... VP9
- ☐BHUTAN ... A5
- ☐BOLIVIA ... CP
- ☐BONAIRE ... PJ9
- ☐BONIN ... JD1
- ☐BOPHUTHATSWANA ... H5
- ☐BOTSWANA ... A2
- ☐BOUNTY ISLAND ... ZL
- ☐BOVET ISLAND ... 3Y
- ☐BRAZIL ... PP–PY
- ☐BRIT CYPRUS ... ZC
- ☐BRITISH VIRGIN ISLANDS ... VP2V
- ☐BRUNEI ... V8
- ☐BULGARIA ... LZ
- ☐BURKINA FASO ... XT
- ☐BURMA ... XZ
- ☐BURUNDI ... 9U
- ☐BYELORUSSIA ... UC
- ☐CAMEROON ... TJ
- ☐CAMPBELL ISLAND ... ZL4/A
- ☐CANADA ... VE
- ☐CANARY ISLANDS ... EA8
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- ☐CAPRI ISLAND ... IC
- ☐CAYMAN ISLANDS ... ZF
- ☐CELEBES ... YB
- ☐CENTRAL AFRICAN REPUBLIC ... TL
- ☐CENTRAL KIRIBATI ... T3
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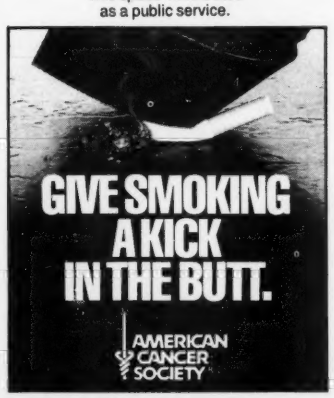

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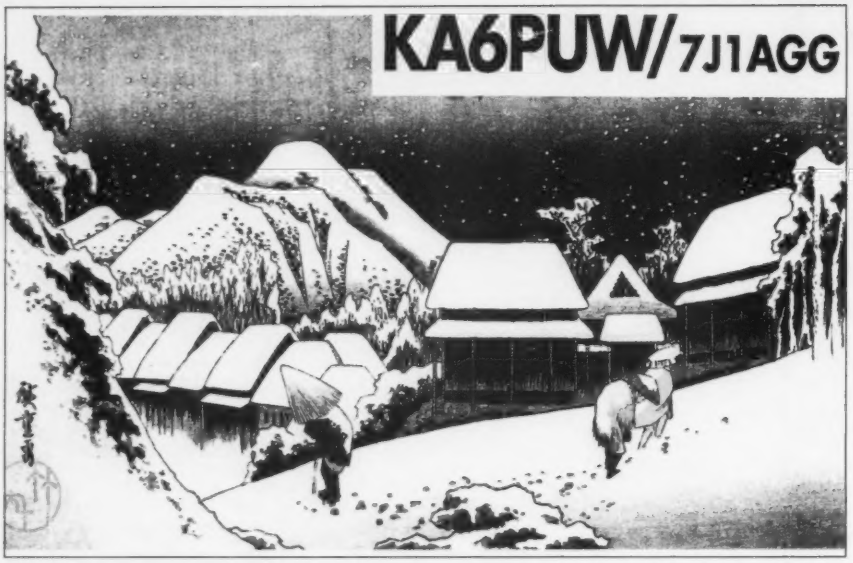

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Never Say Die

Continued from page 4

The Goal

For the Alzheimer's stricken geriatrics, the purpose of this exercise is twofold. We need new directors running the League so they'll (1) establish a task force to clean up our bands. Talk about trash! All you have to do is tune 14,313 and listen to Herb and his amateur radio wrecking crew to see how bad things have gotten. And (2) establish a task force to get newcomers into the hobby.

Can these goals be achieved with president Price and the current directors? They've had years to make a move and we haven't seen anything but talk.

So let's see some action toward the first real ARRL elections in the League's history.

Why Bother?

Let me replay Wayne's old tune. It may have totally escaped you that we have lost our consumer electronics industry. . . that America no longer manufactures the billions of dollars of hi-fi's, TVs, radios, cassette players, boomboxes and calculators which Japan has parlayed into the world's greatest financial empire. We buy their radios and they buy CBS.

This manufacturing loss means we've in turn lost the supporting industries such as parts manufacturing and the continuing research support which all this manufacturing required. Indeed, the evidence is strong that the sudden lack of young hams in the late '60s and early '70s, the League's contribution via their disastrous Incentive Licensing strategy, so weakened American research strength that the Japanese were able, through their no-code licensing move, to capture our consumer electronics industry.

A manufacturing industry, without new product research to support it, doesn't last long.

Now, with cars depending more and more on electronics, even our automotive industry is being seriously hurt by our shortage of new engineers, technicians and scientists.

If we can get the League to take this situation seriously and gear up to attract newcomers to amateur radio, we're going to need at least 50,000 new young hams a year before we'll even have a prayer of regaining our electronic industries.

The key to getting this revolution going is to dump the old guard directors and vote in new ones. Yes, I know, it's too much trouble. The Russian (socialist) answer to every new idea is the same: (1) It can't be done, and (2) We're tired.

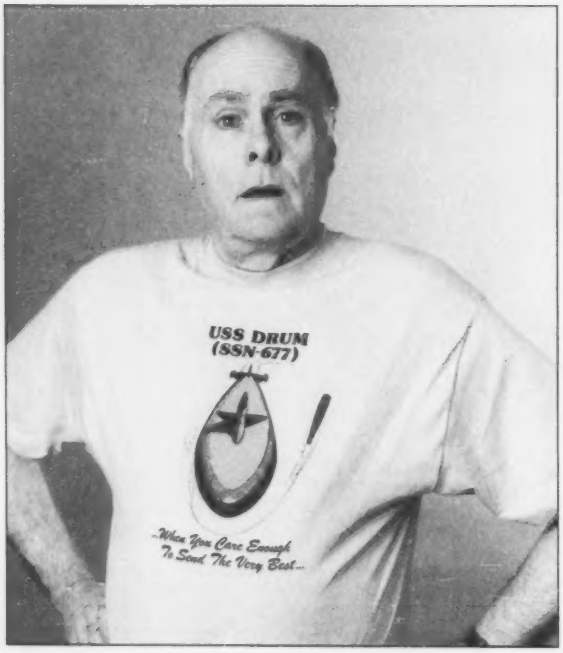
Are you really too frightened and tired to let me know what's going on in your division so I can help you clean house?

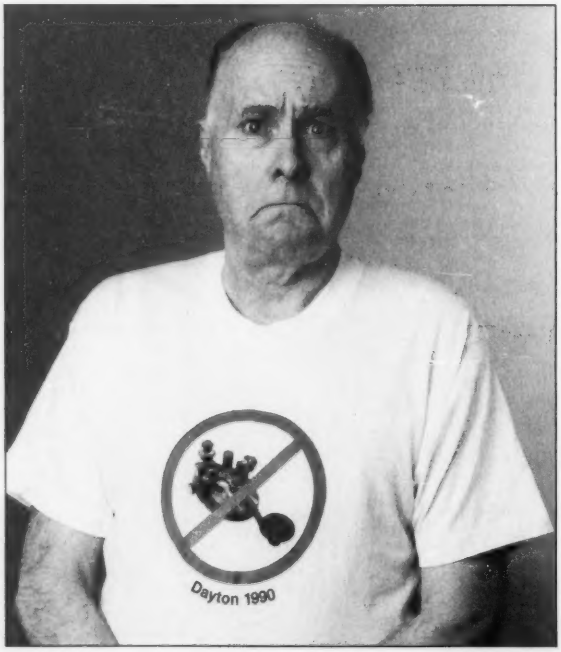
Do It Yourself?

This "trashing" of the ARRL by suggesting you get them to do the most logical and needed thing is a last ditch act. I've come up with this outrageous and probably completely unworkable idea in desperation.

First I wrote editorials asking you to do something about the mess on our bands and repeaters. I asked you either to take individual responsibility and actually go on the air and try to reason with the handful of crazies who are screwing up amateur radio for the rest of us . . . or to at least get your club interested in a group attempt to clean up the mess you've allowed to build up.

Okay, I wrote about it at length and





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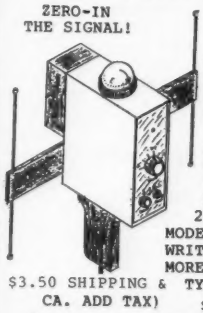

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then I waited. I listened on the air for any signs that one single reader or ham club was showing the slightest hint of social responsibility. I anxiously read every club newsletter coming my way, looking for any sign of intelligent life in the ham universe. Zilch. Nothing. Bubkes.

I went on a several year rampage trying to get any reader or club to take seriously our need to attract youngsters into our hobby. I cajoled. I wept. I threatened. I raged. I even tried logic. And what did I get for all my trouble? A few "hey, right on" letters. Some letters asking me to stop bothering you with facts. And a continued downslide in the FCC statistics.

If I see ARRL director Marshall Quiat re-elected this year I'll know for sure that there isn't one ham in the entire Rocky Mountain Division with any real interest in amateur radio's future. . . that this whole thing is completely, totally hopeless. I can't believe there isn't anyone in the whole division with enough pride in our hobby to stop such a travesty.

20 Meters Poisoned!

The self-righteous officious bullies, lead by KV4FZ, started their poisoning on 14,313. But this mean-spirited hatemongering soon spread to 14,300 and then 14,275. It further festered when all-mouth, no-ears K1MAN entered the fray.

We'd already had complaints by the gross over Glen (MAN)'s endless blind broadcasts on 14,275. It was bad enough that W1AW, run totally by a computer, fired up to broadcast messages day and night on the bands; now hams seemingly more interested in ego gratification than being of any serious service were getting into the act.

The 14,313 mess naturally spread to adjoining channels, as did the growing mess on 14,300. The result these days is often one big unholy sewer stretching pretty much from 14,275 on up to 14,325. We've essentially lost 50 kHz of the band to this gawdawful nonsense.

The more I listen to this vocal stench, the more I feel it's time to push the FCC for some changes in our rules. We don't need the FCC to try and sort out who the bad guys are, we just need to have them make it far easier to lift licenses. The police can take your driver's license away on the spot when they catch you screwing up. So why can't the FCC yank a ham ticket?

Right now it's almost as difficult to de-license someone as to get the death penalty. Phooey. If the FCC would tune into our 20m mess and start issuing some license suspensions wholesale, they could clean up our biggest ham garbage pail in short order. It smells so bad around 14,313 that even if they issued license suspensions for anyone caught transmitting anywhere near the channel, it would take most of a year just for the stink to die down.

The small band of idiots who have loused up our band need to be punished. No, I don't think we should hang them. . . perhaps a simple chopping off of their push-to-blather finger would suffice.

If you can come up with a proposed rule making a change which would allow legitimate ham clubs to get the FCC to suspend licenses, I'll help you get it passed. The catch. . . the rule has to some way prevent the bad guys from forming a club and getting the good guys suspended. Or perhaps we should consider adopting the old Vietnam concept: "Kill'em all and let God sort it out."

Curing The Welfare Mess

An editorial in *Newsweek* (Aug. 13, p. 8) recommends the Israeli kibbutz system as a way to revitalize inner-city neighborhoods. Good idea, even if I did propose it several years ago in much greater detail in a *73* editorial during the New Hampshire primary. I even proposed a way to get the project funded by private industry instead of making it still another federal deficit enhancer.

The deficit. The Big D! Politicians have been waving this at us, chanting "doom." I'll bet they have you actually believing the deficit is a terrible problem. You've read it a thousand times, so you ought to believe it, even if it's a giant red herring. Check out *Business Week* (July 30, p. 10) and stop being conned. No economist has found any evidence that the deficit is a significant problem. It's just that it seems like it really ought to be a problem, so we're being manipulated by the politicians and their media prostitutes (as usual).

Israel, faced with tens of thousands of refugees, few with any money or skills, solved the problem by setting up kibbutzim. These were groups, working together to grow food and manufacture simple products. They devised an ingenious system which has worked wonderfully.

The main ingredient I'd add today to help solve our American welfare and inner-city problems would be amateur radio clubs. This is what made the enormous difference for Jordan. As Santayana said, if we can't learn from history. . . etc.

At any rate, thanks *Newsweek*, for the editorial supporting my idea. . . which, far's I know, was original.

Gus Is Gone!

Amateur radio has lost a real pioneer. Gus Browning W4BPD was the ideal ham. . . gutsy, willing to go anywhere in the world. . . an adventurer. He gave thousands of us DXers years of excitement, bringing a new life to amateur radio.

Tens of thousands of hams had the thrill of contacting him in Afghanistan, Bhutan, Mali and many other countries. Hundreds of thousands enjoyed reading his fascinating stories of his adventures. Gus had an enormous impact on our hobby.

In a hobby which has turned sour with bickering in recent years, Gus was always upbeat, invariably bringing his indomitable spirit to his contacts.

Amateur radio is much the poorer for Gus' moving on the the next order of things. Few, if any, people have contributed as much as Gus to this hobby. . . and thus to their fellow man. 73

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 E. Chateau Circle
Payson AZ 85541

The Best and the Worst

October is usually one of the best months of the year for worldwide HF propagation, and it looks like this month will rank among the best in several years for good DX. However, the first half of the month appears excellent while the second half may be somewhat disturbed for propagation.

You can look for mild disturbances on the sun between the 1st and the 5th of the month, which will result in an increased "A" Index. This means an increase of flux density in the Earth's magnetic field and deteriorating propagation—but nothing serious—accompanied by a decline in the 10.7 cm solar flux density.

From the 6th through the 16th, conditions should be excellent for DX propagation. Beginning about the 17th and increasing in severity to the end of the month, you may expect a very unstable period on the sun, and of course, on the Earth. This two-week span ought to provide solar flares which result in a very disturbed magnetic field on Earth. The Boulder "K" Index and the Boulder "A" Index will be high, and solar flux may be low for this period, resulting in very poor worldwide propagation. On some days during this period conditions will be fair at best. The weekends of the 20th to the 21st and the 27th to the 28th may provide some let up in the generally dismal outlook, with fair conditions prevailing.

The Unpredictable

As always, your best monitor of day-to-day conditions is the WWV broadcast at 18 minutes past each hour when solar-terrestrial conditions are given in detail.

Meanwhile, use the calendar and table for planning your forays into the DX jungle. The daily chart of forecast conditions shows G (Good), F (Fair), and P (Poor) for each day, and *trends* from Good to Poor (G–P) and Fair to Poor (F–P).

Because the sun is extremely unpredictable during a sunspot peak, these forecasts could range from "right on" to "way off." Forecasting is still more of an art than a science, though we have observed that the Earth's atmosphere and geology are affected by solar behavior. Therefore, in periods surrounding a *predicted* poor forecast, observe what's going on with regard to hurricanes, volcanic eruptions, and earthquakes in the world.

See you next month with, we hope, a more positive forecast. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	15
ARGENTINA	15	15	20	40	40	—	—	10	—	—	15	15
AUSTRALIA	15	20	20	20	20	40	20	20	—	—	—	15
CANAL ZONE	15	20	20	20	20	15	15	10	10	10	20	10
ENGLAND	20	40	40	40	40	—	—	15	10	15	15	20
HAWAII	15	15	20	20	20	20	20	20	—	—	—	15
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	15
MEXICO	15	20	20	20	20	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	15	10	—	—	15
PUERTO RICO	15	20	20	20	20	15	15	10	10	10	20	10
SOUTH AFRICA	20	40	20	20	—	—	—	—	10	10	15	15
U.S.S.R.	40	40	20	20	—	—	—	15	15	—	20	20
WEST COAST	20	20	20	40	40	—	—	20	15	15	20	20

CENTRAL UNITED STATES TO:

ALASKA	15	15	20	20	20	—	20	20	—	—	—	15
ARGENTINA	15	15	20	20	20	—	—	10	—	—	10	15
AUSTRALIA	15	15	15	—	20	20	40	20	—	—	15	10
CANAL ZONE	15	15	20	20	20	—	—	—	15	20	10	10
ENGLAND	40	40	40	—	—	—	—	—	15	15	20	20
HAWAII	15	15	15	20	20	20	40	20	—	10	10	10
INDIA	15	15	—	—	—	—	—	15	—	—	—	—
JAPAN	15	15	20	20	20	—	20	20	—	—	—	15
MEXICO	15	15	20	20	20	—	—	—	20	20	10	10
PHILIPPINES	15	—	20	20	—	—	—	—	15	15	—	—
PUERTO RICO	15	15	20	20	20	—	—	—	20	20	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	15	20
U.S.S.R.	—	—	—	—	—	—	—	15	15	15	20	20

WESTERN UNITED STATES TO:

ALASKA	15	15	15	20	20	20	—	20	20	—	—	15
ARGENTINA	15	15	15	20	20	—	—	—	—	—	10	10
AUSTRALIA	10	15	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	20	20	20	20	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	20	20
HAWAII	15	15	15	15	20	20	40	—	15	10	—	—
INDIA	—	15	20	—	—	—	—	—	15	15	—	—
JAPAN	15	15	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	15	20	20	—	—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	15	—	—
PUERTO RICO	10	15	15	20	20	—	—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U.S.S.R.	20	—	—	—	20	—	—	20	20	20	20	20
EAST COAST	15	15	20	40	40	—	—	15	15	15	15	20

Notes: 1. The numbers usually indicate the highest usable frequency band. Where two bands are listed (20/40, for example), both could well work on that path at that time. 2. Always look at the next highest band as well for any listing. 3. For WARC bands, use 10 for 12, 15 for 17, and 40 for 30 meters.

OCTOBER

SUN	MON	TUE	WED	THU	FRI	SAT
	1 F	2 F	3 F	4 F–G	5 G	6 G
7 G	8 G	9 G	10 G	11 G	12 G	13 G
14 G	15 G–F	16 F	17 F–P	18 P	19 P	20 P–F
21 F	22 F–P	23 P	24 P	25 P	26 P–F	27 F
28 F–P	29 P	30 P	31 P			

RANDOM OUTPUT

David Cassidy N1GPH

For the past few months, a ham down in Virginia has been writing and calling the *73* offices. After some rather lame insults directed at Wayne (and some very strange comments lumping John Kennedy, Jimmy Carter, Richard Nixon, Ronald Reagan and George Bush into the same political category), he asks us to reprint a petition that was filed with the FCC, requesting an expansion to the Novice/Tech phone privileges on 10 meters. The following is an excerpt from his letter:

"I own a Radio Shack HTX-100 transceiver, which, at most, puts out 25 watts . . . I am forced to operate at low power with a ¼ wave vertical antenna. I can afford to purchase a much better transceiver, but I live so close to my neighbors that I must operate QRP . . . Novice and Technician operators are being totally clobbered out of contacts with other Novices and Technicians by General, Advanced and Extra Class 'amateurs' . . . 73 Magazine, *and Wayne Green, overtly and covertly clobber anyone and everyone in amateur radio who don't share their Country Club Republican 'values' . . . i.e., if you don't own $50,000 of 'amateur' equipment, and a $750,000 suburban estate to install it on, you ain't worth talkin' to!"*

He goes on to insult Wayne, *73*, and just about everyone who he thinks is to blame for his lousy results on 10 meters (I won't bore you with the rest of it). He is also quite angry that, even though Wayne wrote to him personally with some helpful suggestions, we have yet to respond to him in the pages of *73*. I hope he will consider this an "official published response": Lighten up, pal!

We're talking ham radio here, not brain surgery! Who ever promised you you'd have a clear frequency? If operating on the rest of the 10 meter band is so important to you, upgrade to General Class. Why not strive to do the best with what you have, instead of blaming everyone but yourself for your lack of success? (How anyone could not be successful on 10 meters for the last two years is beyond me. Do you think this guy might have his antenna plugged into his microphone jack?) If you put as much effort into studying for your General ticket as you do into writing long-winded letters, you'd be on 20 meters with the rest of the weirdos by now (my apologies to all the nice people who operate on 20 meters—the weirdos know who they are).

Now that I've got that out of my system (or at least suppressed for the time being), let's take a look at the one point that this gentlemen raises that deserves some serious thought. Can a Novice/Tech get on the air, make contacts and have fun, without an antenna farm the size of Southforks Ranch and a cash outlay for equipment the size of Fort Knox? The answer . . . yes. How do I know? I've been doing it for years.

The Low Budget Ham

My first amateur radio station was a borrowed Heath HW-16 and a 15 meter dipole strung outside my bedroom window. Total cost to my 13-year-old pocket . . . about two bucks for the wire (somebody gave me the 12 feet of coax I used as a lead-in.) Did I work the world? No. Did I have a blast working Texas? Yes!

For the past two years I have been operating almost exclusively in the Novice/Tech portion of 10 meters (that's where most of the action has been). I have over one hundred DX countries (some of them worked, with much patience, in the middle of pile-ups). My "super-expensive-deluxe" rig? A Heath HW-101 that my Dad built about 15 years ago. Total output on 10 meters? About 50 watts. My "spacious antenna array"? A full-wave loop, cut for 10 meters, fed with 400 ohm ladder line through a used MFJ tuner, wrapped around the inside of my bedroom window in the middle of Hamden, Connecticut. (One of the fringe benefits of moving to New Hampshire to work for Wayne is that I am finally able to put up some outside antennas.)

Let's look at the total cash outlay to duplicate this station:

- Used HW-101—$150 (I've seen dozens of them for this price)
- Used antenna tuner—$40 (or build or buy a new one for not much more)
- Used SWR Meter—$30
- Used Microphone—$40
- Wire Antenna—$5 (this is high, but let's not pick nits)
- Ladder Line—$20 (this should give you enough for 4 antennas)
- Total Cost: $285

Any hardworking 10-year-old with a paper route can save $285 in a couple of months. I used this station for over two years, operating from a one-bedroom apartment. No, I wasn't the loudest signal on the band, but every 5-8 report was a personal triumph. I got a great deal of satisfaction telling stations all over the world what my set up was. Most of them took a few seconds out from working the pile-ups to congratulate me on doing so well with so little. Not once did I feel like I needed a more elaborate station. Instead of complaining about my antiquated gear, indoor antenna, noisy power lines and lack of any real ground system, I just decided to work around the obstacles and have some fun. I learned a lot in those two years. I made some good friends, too. I learned something about radio and electronics from each one of them. I was having a ball!

Isn't that what amateur radio is all about? 73

Uncle Wayne's Bookshelf

06S57 • **1991 Passport to World Band Radio** *by International Broadcasting Services, Ltd.*
You can have the world at your fingertips. You'll get the latest station and time grids, the 1991 Buyer's Guide and more. 384 pages. **$14.50**

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	IBM Part #	Commodore Part #	Price
Novice	IBM01	COM01	$14.95
Tech	IBM02	COM02	$14.95
General	IBM03	COM03	$14.95
Advance	IBM04	COM04	$19.95
Extra (New Pool)	IBM05	COM05	$19.95

IBM97 • **Amateur Radio Part 97 Rules** (includes updated, revised Commission's Rules, September 30, 1989) 5¼" disk IBM compatible only. **$9.95**

10M012 • **Map Library** *by Radio Amateur Callbook Inc.*
Includes: 1 Prefix Map of the World 4-color 40" x 28"
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1 World Atlas 4-color 20 pages **$12.00**

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Guides the newcommer through the maze of new operating and technical procedures. Put together a station and get on the air. **$10.00**

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Designed to answer the basic questions the beginner may have about equipment, antennas, and procedures. **$1.00**

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11SR97 • **National Directory of Survival Radio Frequencies**
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11SM11 • **Scanner Modification Handbook** *by Bill Creek*
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11EE06 • **Guide to Embassy Espionage Communications**
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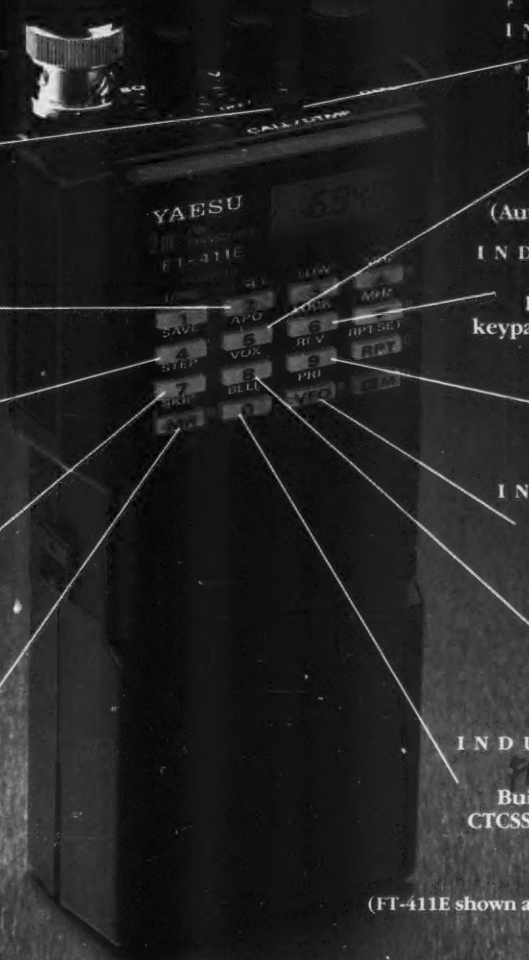

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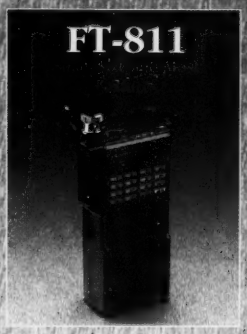

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